

Carroll

John Blachner

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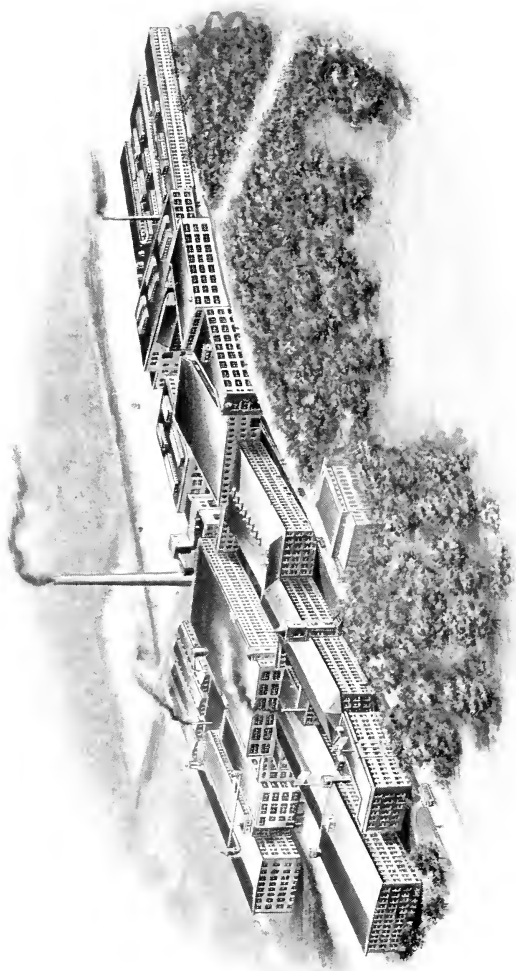
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WHITIN
COTTON YARN
MACHINERY

1923 EDITION



MAIN OFFICE AND WORKS

ILLUSTRATED AND DESCRIPTIVE
CATALOG
of
WHITIN
COTTON YARN MACHINERY
AND

Handbook of Useful Information
For Overseers and
Operatives

FOURTH EDITION

WHITIN MACHINE WORKS

Whitinsville, Mass., U. S. A.
Branch Office, Charlotte, N. C.

Press of
C. A. HACK & SON, Inc.
Taunton, Mass.
U. S. A.

MB 5536

INTRODUCTORY

IN compiling this fourth edition of our catalog on Cotton Yarn Machinery we have endeavored to describe as concisely as possible the various machines as improved since the issue of the third edition in 1919. With the descriptions we furnish data such as floor spaces, speeds recommended, weights, power consumption, production, change gear tables, rules for operatives, etc., which we trust will be found useful to anyone operating our make of machinery.

It may be of interest to our customers and others to know that the manufacture of Cotton Machinery was commenced in Whitinsville in 1831, and that our working plant, exclusive of tenements, now comprises forty acres of floor space, and at full capacity requires 4000 employees. In recent years many new tools and appliances have been installed for the accurate and rapid production of our machines, and at the present time we are in a better position than ever to promptly meet our orders and furnish machines which are unequalled as regards design, material and workmanship. These superior manufacturing facilities have been augmented by an exacting and rigorous system of shop inspection, to the end that the high reputation for superior quality of our machines shall be maintained.

We are always pleased to discuss the requirements of textile manufacturers and others, furnish estimates of machinery for new mills or reorganizations of old mills, and give any further information desired concerning our machines which are not treated of in this catalog.

WHITIN MACHINE WORKS.

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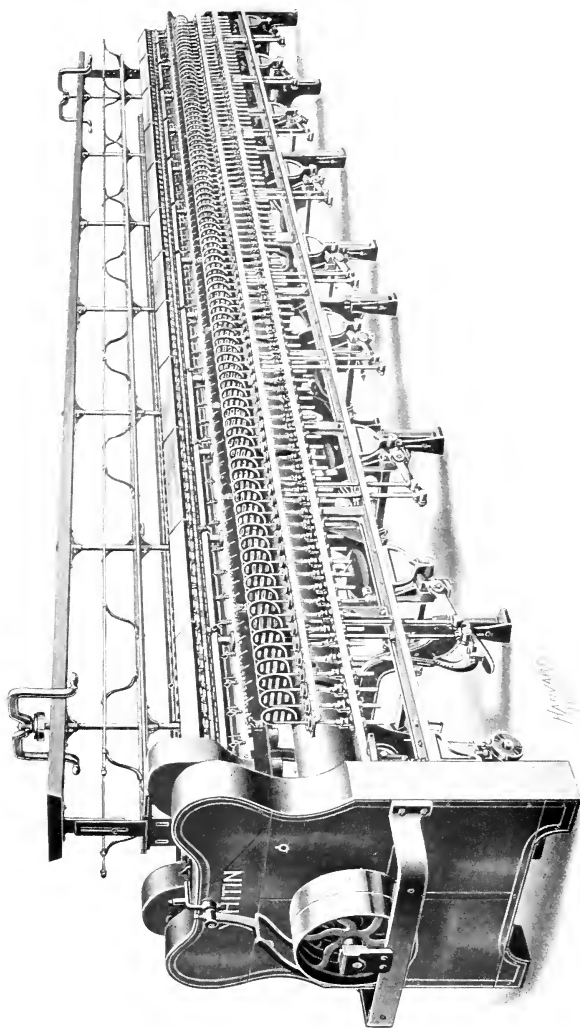
NOTICE

Owing to changes that may have been made in the details of our machines since the issue of this catalog, we cannot assume any responsibility for the dimensions and floor plans given in the catalog unless verified by our Engineering Department. Up-to-date floor plans should be obtained from us before planning for the installation of our machines.

Whitin Machine Works.

SPINNING

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Ring Spinning Frame, with Band Driven Spindles
Model A.

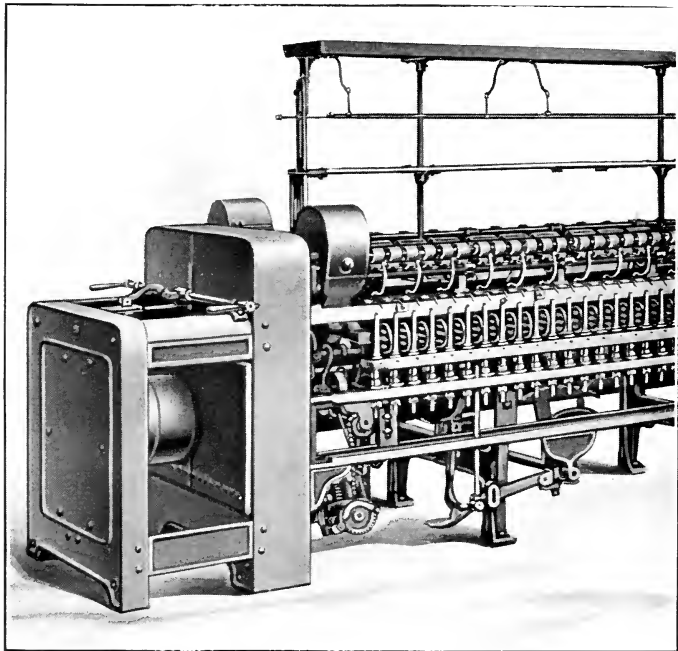


Ring Spinning Frame, with Tape Driven Spindles
Model B.

THE WHITIN RING SPINNING FRAMES

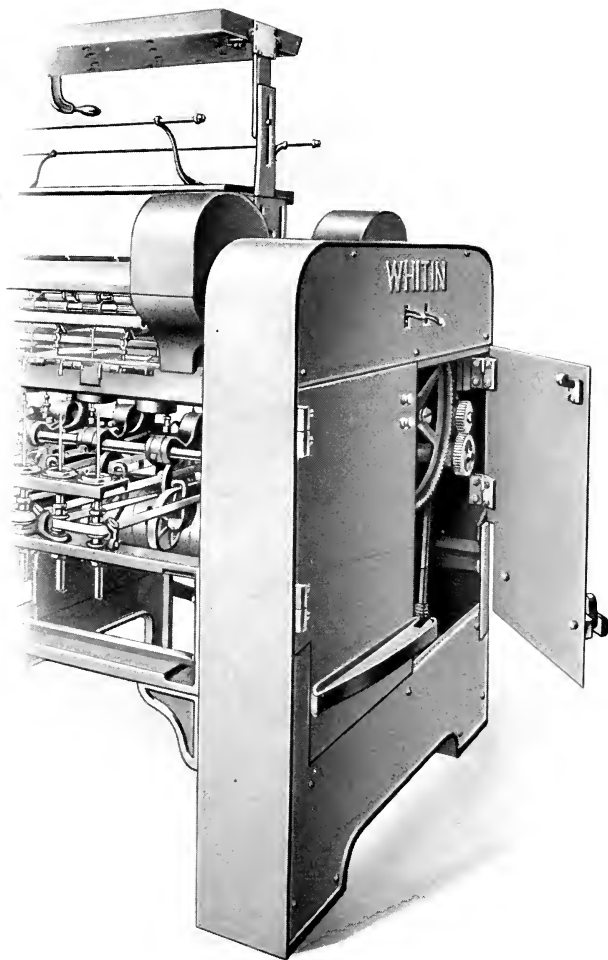
For Cotton Warp, Filling and Hosiery Yarns

[The **Whitin Spinning Frames** command today, as they always have in the Past, a leading position with regard to design, construction and operative features. Four types are made, viz.: Model A, Model B, Model C and Model D, differing from each other in the drive of their spindles, and, also in their gearing mechanism.



Frame with Outboard End

Model A (see illustration, page 12) is equipped with band driven spindles and a chain driven builder motion. This frame is usually furnished only for matching up old equipment.

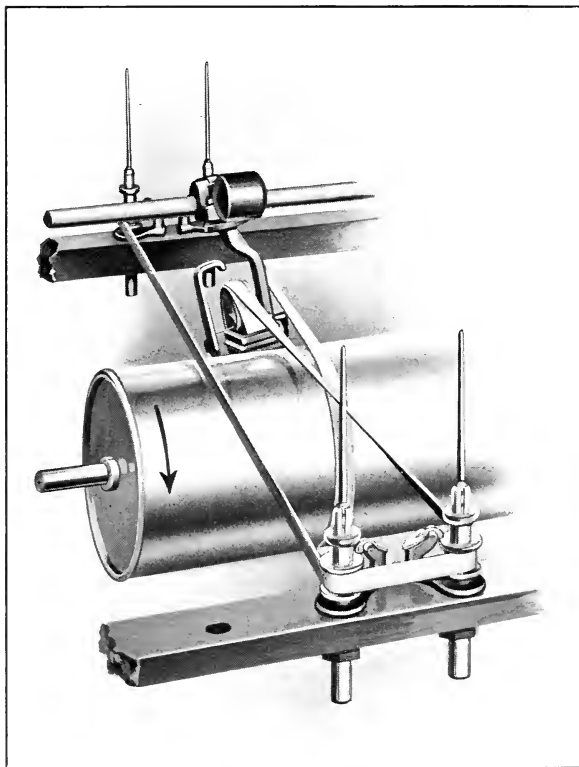


Head End with Swinging Panels

Model B (see page 13) has tape driven spindles and a shaft driven builder motion. It is a popular type with manufacturers.

Model C is similar in design to Model B, with the exception of being equipped with band driven spindles.

Model D is similar in general construction to Model B, but has some features making it especially adapted for export trade.

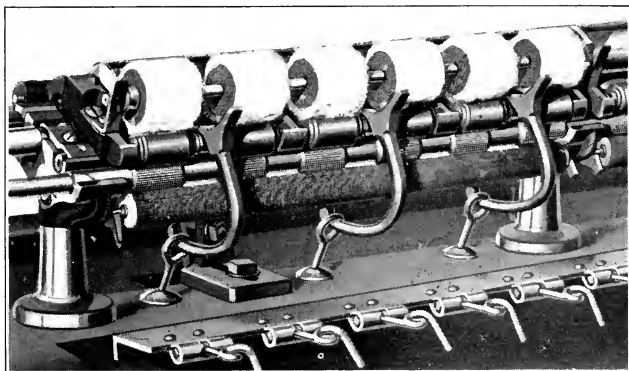


Tape Drive

The following description of details of construction is applicable to all types of frames:

The Framing is substantial, with extra wide roll beams and spindle bolster rails on the double web rail principle, with bridge connections between sampson supports. The foot end and sampsons are provided with loose feet for adjustment to suit uneven flooring.

The Head End is specially designed to facilitate the necessary twist gear changes. Cut gearing with wide faces is used. Convenience is provided for oiling, and all parts that are not readily accessible for oiling are provided with oil tubes, having their orifices placed in positions convenient to the operatives. The ends of the frame are enclosed by either swinging or sliding panels which form guards against accident.



Revolving Clearer

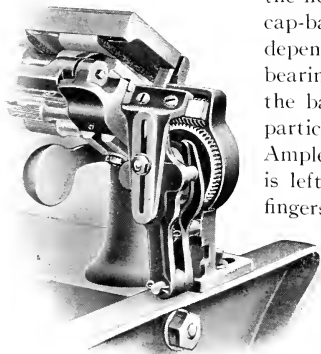
The Fluted Rolls are made of the best roller steel, and are irregularly fluted to avoid liability of cutting the covering of the top-rolls. All rolls are fitted together and numbered in the shop, to insure proper running in the mill.

We are equipping most of the frames we now build with **Front Steel Rolls Case-Hardened** and in a good many instances we case-harden all three lines. This hardened roll is beautifully finished, and is highly desirable because the flutes remain sharp for a much longer time than those of the ordinary crucible steel roll, as the outer casing of the roll is so hard, it is not so readily nicked by the spinners' hooks, and wearing of the roll necks is obviated.

The Top-Rolls are usually furnished covered, either shell or solid, and weighted with any of the various saddles on the market, as desired by the purchaser. Self-weighted top-rolls are also furnished to the mills preferring this method of weighting.

The Top-Roll Clearers may be either stationary or revolving style as preferred.

The Roll Stands with their adjustable slides have milled bearings for steel rolls. The bearings are of such width as to insure long life to the neck of the rolls. The detachable cap-bars are arranged to work independently, the finger at each bearing being divided so that when the bar is thrown back, only its own particular set of rolls is affected. Ample space for oiling the roll bearings is left between the halves of cap-bar fingers over the roll bearings.



A variable **Roving Traverse Motion** is supplied. It is adjustable as to length of traverse, and has a variable motion, which prevents unequal wear of leather top-rolls.

Roving Traverse

Our Frames are equipped with either band or tape driven **Whitin Gravity Spindles** as ordered. These spindles are notable for simplicity of construction, steadiness in running, and durability. In addition, they possess great advantages in consuming a minimum of power and the avoidance of throwing oil. They are made in three standard sizes, viz:

| | |
|------------------|-------|
| Standard Gravity | No. 1 |
| Medium Gravity | No. 1 |
| Large Gravity | No. 1 |

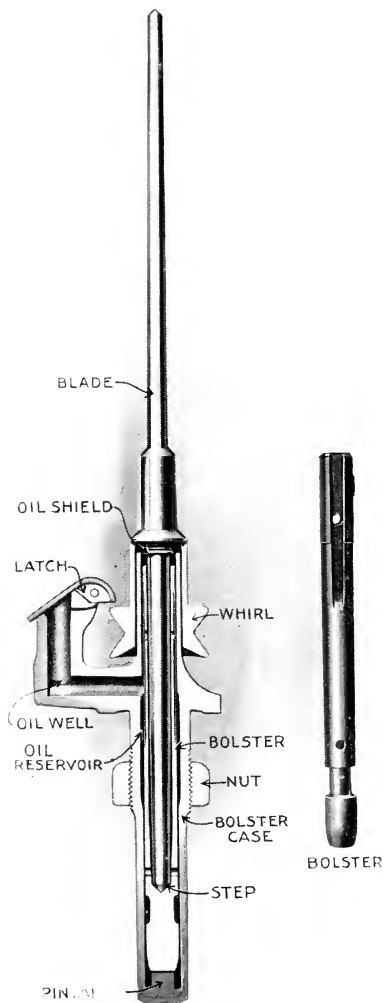
All these spindles are of the same general construction, but vary as to sizes and diameters of whirls.

A very popular spindle is the Whitin Gravity Spindle fitted with centrifugal clutch.

We are also prepared to make Draper No. 2, No. 4 and No. 5 types of spindle, and can furnish Rabbeth, Sherman or McMullen spindles when ordered.

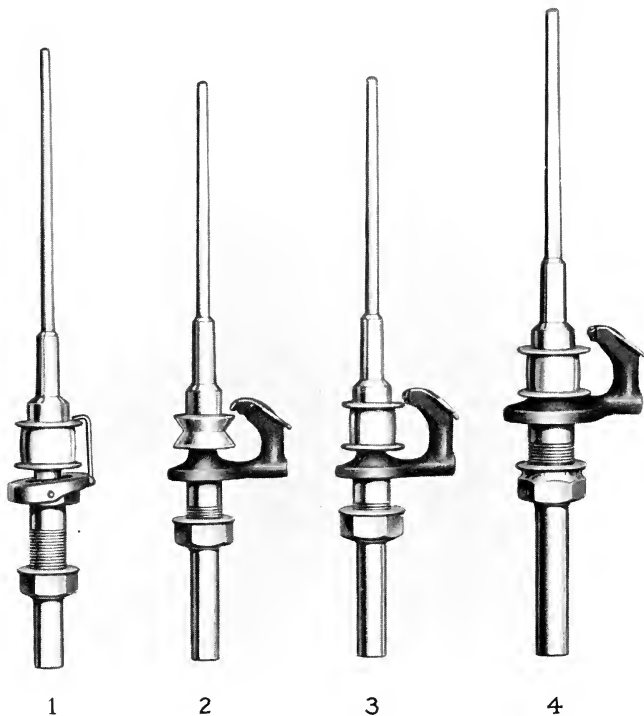
For spinning warp yarns, we recommend the Large Gravity Spindle for coarse yarns, from 4's to 12's, the Medium Gravity Spindle for all counts, from 12's to 24's, and the Standard Gravity Spindle on all finer counts.

For spinning filling and hosiery yarns, we recommend the Medium Spindle on coarse counts to 20's, and the Standard Spindle on all finer counts.



Section of Whitin Gravity Spindle

Whitin Spindles



- 1—Shows a 3A Spindle with Steel Bolster Case.
- 2—Shows a Medium No. 1 Spindle.
- 3—Shows a Standard No. 1 Spindle.
- 4—Shows a Large Gravity No. 1 Spindle.

Spinning Rings



Double-Adjustable
Ring.



Single Flange
Ring.



Common
Spinning
Ring.

We also recommend the use of large whirls on spindles, as this tends to give a regular speed, uniform twist, less breakage of bands, and a reduction in repairs in spindles and cylinders.

The following spindles are what might be called "Regular", as regards sizes of whirls:

| | | | | |
|----------|-------|------|-------------------|----------------|
| Standard | No. 1 | with | $\frac{15}{16}$ " | diameter whirl |
| Medium | No. 1 | " | $1\frac{1}{8}$ " | " " |
| Large | No. 1 | " | $1\frac{5}{16}$ " | " " |

To suit special conditions the Standard Spindle may be fitted with $\frac{3}{4}$ ", $\frac{13}{16}$ ", $\frac{7}{8}$ " or 1" diameter whirls; the Medium with $\frac{13}{16}$ ", $\frac{7}{8}$ ", $\frac{15}{16}$ " 1", $1\frac{1}{16}$ ", $1\frac{1}{4}$ " or $1\frac{5}{16}$ " diameter whirls, and the Large with $\frac{15}{16}$ ", 1", $1\frac{1}{16}$ ", $1\frac{1}{8}$ " or $1\frac{1}{4}$ " diameter whirls; but, as a general rule, we prefer not to fit any spindle with less than $\frac{7}{8}$ " diameter whirl, with the possible exception of the Standard Spindle.



Double Adjustable Ring in Round Plate Holder.

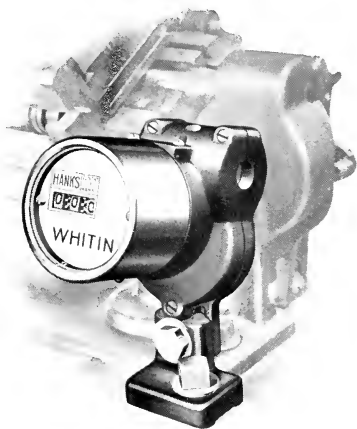


**Double-Adjustable Ring in Cast-Iron Holder
with Inclined Pin Traveler Holder.**

Rings of our own make are supplied unless otherwise ordered, cast-iron or plate-ring holders as preferred. Efficient Traveller Cleaners can also be had if desired. The Ring Rails, of rugged construction, are made in short lengths, thus decreasing the liability of deflection. The rails are secured to milled heads of the lifting rods in such a manner as to prevent any undue vibration while working, and, at the same time, being easily removed when desired. The level of the rails is corrected by a novel construction of the lifting rod arms, as is best shown in the illustration of the separator motion on page 24.

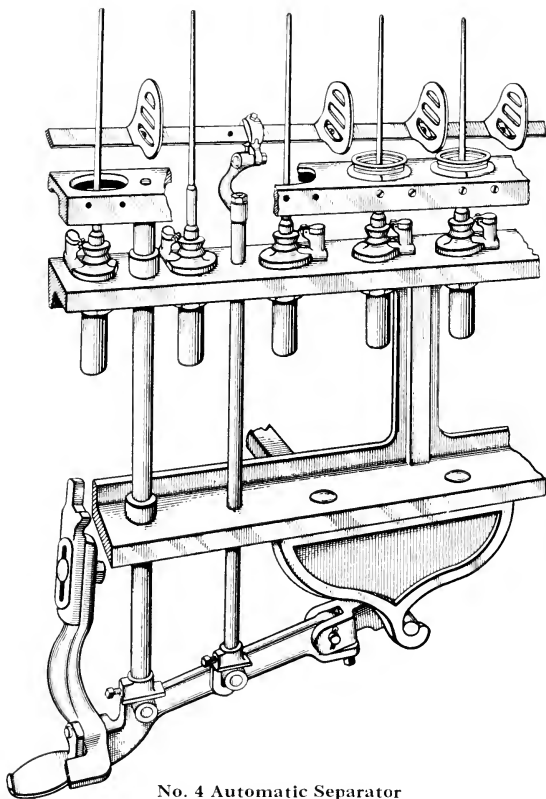
If desired, our frames may be equipped with a **hank clock** of our own make, which registers the hanks and decimal part of a hank delivered by

the front roll. It is dust proof and constructed so as to be practically free from unauthorized adjustments by operatives.



Hank Clock

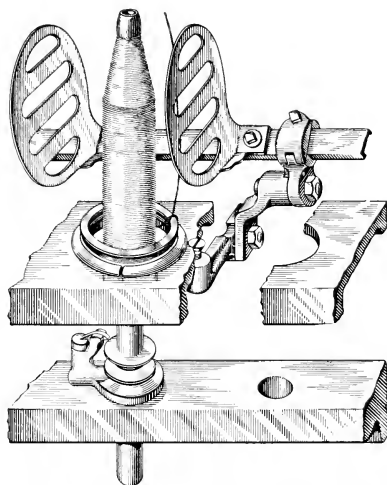
To eliminate this evil, we recommend **Wide Gauge Frames**, as by eliminating the whip against the separator it can be readily appreciated that a higher spindle speed can be run and a better quality of yarn obtained. In the same floor space, wide gauge frames will give a yarn production equal to that produced on narrow gauge frames with more spindles, provided the gauge of the wide space frame is properly adapted to the number of the yarn.



No. 4 Automatic Separator

Also, a better quality of yarn is produced at a less cost. If narrow gauge frames are ordered, we can furnish either our No. 4 or No. 5 Separator. The blades of the No. 4 Separator are made of stamped steel and are

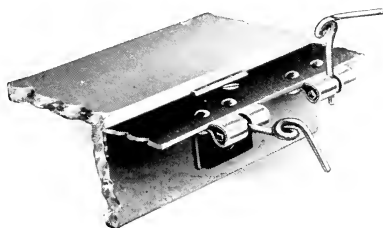
fastened to a rod hinged to brackets on top of auxiliary lifting rods which have a vertical reciprocating movement due to motion transmitted through the regular builder mechanism cross-shaft as will be readily understood by reference to the illustration. When doffing, the separator blades may be conveniently and quickly turned back out of the way. The No. 5 is of similar construction except the blade rod is held in brackets fixed to the ring rail.



NO.5 WHITIN SEPARATOR

The frames are equipped with **Thread Boards** of highly polished hard wood, unless metallic thread boards are ordered.

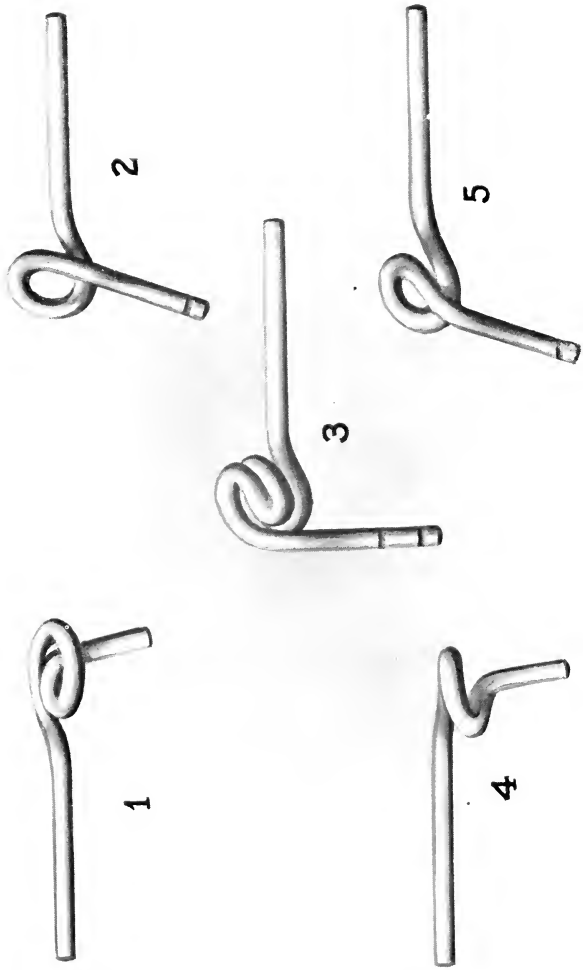
The Whitin Patent Metallic Thread Board is an important improvement to our frames. It consists of a sheet metal back, to which are fastened the thread guide pintal holders. This construction readily allows for lifting up each individual guide, or all the guides at once, as is required.



Metallic Thread Board.

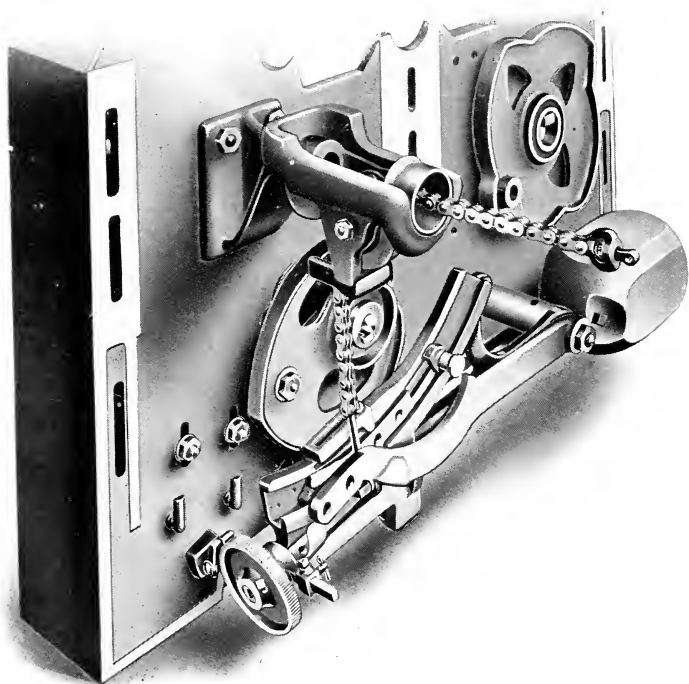
correctly adjusted, it is held in a fixed position by means of a set screw at one end of the pintal. Unintentional tilting of the guides is prevented by means of our patented locking device.

The Thread Guide can be accurately adjusted to the center of the spindle by moving its shank in or out of a hole in the pintal. When



Thread Guides

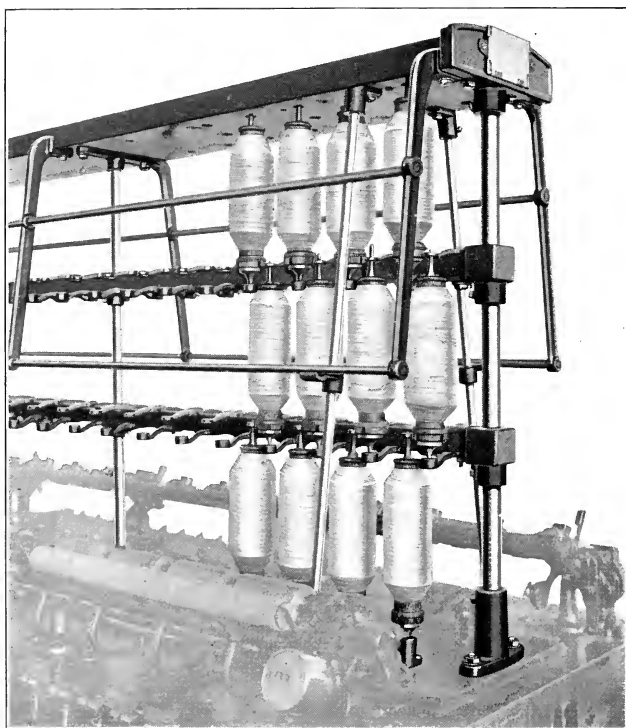
The Builder Motion is arranged for either warp or filling, or both, as desired. The change from warp to filling, or vice versa, is easily accomplished in a few minutes' time. The traverses are from 4" to 8". A **Locking Device** is provided for locking the ring rail during the operation



Builder Motion

of doffing. It is located so as to be conveniently operated by the foot of the spinner before proceeding to doff. It consists of an arm pivoted to head cross-shaft lifting arm in such a manner that when the lifting arm is depressed, the locking arm locks the ring rail at its lowest point automatically; a further slight depression disengages the arm which then drops back, and the ring rail is free to move.

Wooden Creels of usual construction are made either one or two stories for single or double roving, and are adjustable in height for any length of roving bobbin.

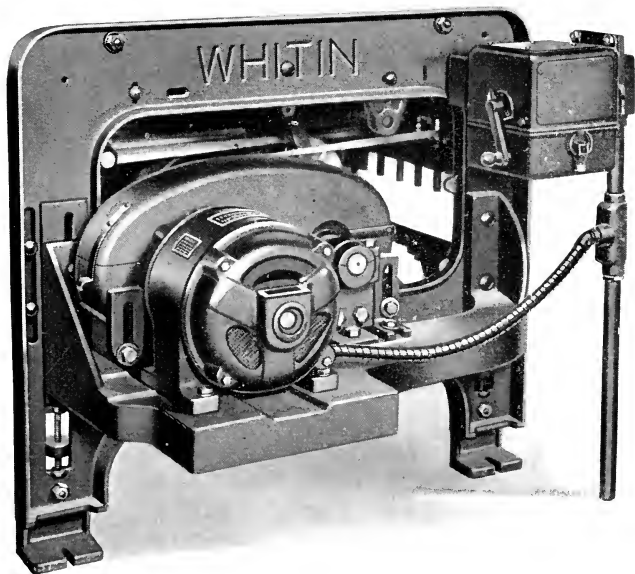


Birkenhead Creel, designed for foreign trade.

The Cylinders are substantially made, 7" or 8" diameter, in short lengths of best grade of material, and are well balanced for high speeds. Where spindle whirles are larger than $\frac{3}{8}$ " diameter we would advise the use of an 8" diameter cylinder, provided, however, that the required spindle speed does not necessitate abnormal speed and sizes of countershaft pulleys

For standard equipment the cylinder journals run in self-oiling plain bearing, but if desired either ball or roller bearings may be had instead. By our improved setting of the boxes, the cylinders may be taken from the frame for repairs, and put back again without any readjustment. The support of the outside end of the pulley arbor serves also as a guard for the pulley and belt.

The Driving pulleys, varying in size from 9" diameter to 22" diameter by 2" to 4" face, are placed on the foot end of the frame, unless ordered to be fitted on the geared end. The loose pulley runs on a sleeve, which is integral with the yoke box, supporting the pulley arbor. When the belt is on the tight pulley, the loose pulley does not revolve. The frame is equipped with a novel, **patented device** that furnishes sufficient tension to the belt shipping mechanism to prevent the belt from creeping from the tight pulley onto loose pulley, or vice versa, and thereby stopping or starting the frame when such change is not desired. Liability of accident to



Geared Motor Drive

an operator while changing the gearing, by the unexpected starting of the frame, is avoided by the use of a locking device applied to the belt shipping mechanism.

If desired, the frames may be built to be driven by an Electric Motor, either by direct connection with the cylinder arbor, or by gearing to the same.

Horse Power. The power consumed by spinning frames depends on several varying factors, viz: the number of yarn, the weight and speed of the spindles, the length of the traverse, the diameter of the rings, the band pull, the lubrication, and the temperature and humidity of the room. Owing to these varying elements it is impossible to set up a standard that will answer all requirements.

Weights per foot in length:

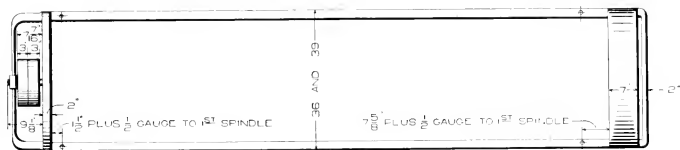
Domestic:

Net, 295 pounds,
Gross, 319 pounds.

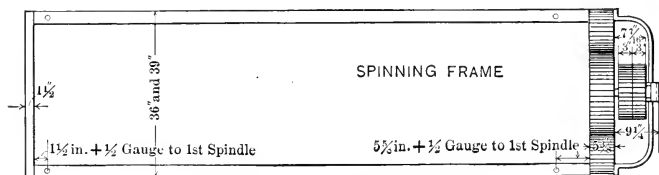
Export:

Gross, 359 pounds
Cubic Feet, 7.8.

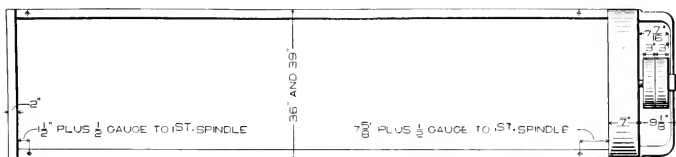
FLOOR PLANS OF SPINNING FRAMES



**Model B, Tape Drive Spindles or Model C, Band Drive Spindles
Foot End Drive**



**Model A, Band Drive Spindles
Head End Drive**



**Model B, Tape Drive Spindles for Model C, Band Drive Spindles
Head End Drive**

Rule for finding the overall lengths of Model B Frames: $\text{Number Spindles} \div 2 \times \text{gauge} + 29\frac{1}{2}$ = length in inches of frame with 3 inch face pulleys.

WHITIN SPINNING FRAMES

Floor Space:—Widths, 36 and 39 inches, and Lengths over all for Model C Band Drive Frames and Model B Tape Drive Frames, as follows:

| Number of Spindles | 4½ inch Space | | 4 inch Space | | 3½ inch Space | | 3½ inch Space | | 3 inch Space | | 2½ inch Space | | 2½ inch Space | | Number of Spindles |
|-----------------------|------------------|-----|-----------------|-----|------------------|-----|------------------|-----|-----------------|-----|------------------|-----|------------------|-----|-----------------------|
| | 6 Boss | In. | 6 Boss | In. | 6 Boss | In. | 6 Boss | In. | 8 Boss | In. | 8 Boss | In. | 8 Boss | In. | |
| 112 | 25 | 0 | 22 | 6 | 21 | 3 | 20 | 0 | 18 | 9 | 16 | 6 | 14 | 9 | 112 |
| 120 | | | | | | | | | | | | | | | 120 |
| 128 | | | | | | | | | | | | | | | 128 |
| 132 | 27 | 3 | 24 | 6 | 25 | 1 | 21 | 9 | 20 | 4 | 18 | 6 | 15 | 6 | 132 |
| 144 | 29 | 6 | 26 | 6 | 25 | 0 | 23 | 6 | 22 | 0 | 20 | 6 | 17 | 3 | 144 |
| 156 | 31 | 9 | 28 | 6 | 26 | 10 | 25 | 3 | 23 | 7 | 22 | 6 | 19 | 0 | 156 |
| 160 | | | | | | | | | | | | | | | 160 |
| 168 | 34 | 0 | 30 | 6 | 28 | 9 | 27 | 0 | 25 | 3 | 24 | 6 | 20 | 0 | 168 |
| 176 | | | | | | | | | | | | | | | 176 |
| 180 | 36 | 3 | 32 | 6 | 30 | 7 | 28 | 9 | 26 | 10 | 24 | 6 | 21 | 9 | 180 |
| 192 | 38 | 6 | 34 | 6 | 32 | 6 | 30 | 6 | 28 | 6 | 26 | 6 | 23 | 6 | 192 |
| 204 | 40 | 9 | 36 | 6 | 34 | 4 | 32 | 3 | 30 | 1 | 28 | 6 | 24 | 3 | 204 |
| 208 | | | | | | | | | | | | | | | 208 |
| 216 | 43 | 0 | 38 | 6 | 36 | 3 | 34 | 0 | 31 | 9 | 30 | 6 | 25 | 0 | 216 |
| 224 | | | | | | | | | | | | | | | 224 |
| 228 | | | | | | | | | | | | | | | 228 |
| 240 | | | 40 | 6 | 38 | 1 | 35 | 9 | 33 | 4 | 32 | 6 | 27 | 9 | 240 |
| 252 | | | 42 | 6 | 40 | 0 | 37 | 6 | 35 | 0 | 34 | 6 | 29 | 6 | 252 |
| 256 | | | | | 41 | 10 | 39 | 3 | 36 | 7 | 34 | 6 | 30 | 6 | 256 |
| 264 | | | | | | | 41 | 0 | 38 | 3 | 36 | 6 | 31 | 10 | 264 |
| 272 | | | | | | | 42 | | | | | | | | 272 |
| 276 | | | | | | | | 9 | 39 | 10 | 38 | 6 | 32 | 3 | 276 |
| 288 | | | | | | | | | 41 | 6 | | | 34 | 0 | 288 |
| 300 | | | | | | | | | 43 | 1 | | | 35 | 9 | 300 |
| 304 | | | | | | | | | | | | | | | 304 |
| 312 | | | | | | | | | | | | | | | 312 |
| 320 | | | | | | | | | | | | | | | 320 |
| 336 | | | | | | | | | | | | | | | 336 |
| 352 | | | | | | | | | | | | | | | 352 |

Above Lengths are for 3-inch Face Pulley; — 3½-inch Face add 1 inch; — 4-inch Face add 2 inches. When Belting on Head End subtract 2" from above Lengths. Model A Band Drive Spinning Frames are 6" shorter than Lengths given in above table

FLOOR SPACE OF WHITIN SPINNING FRAMES WITH OUTBOARD END

| Number of Spindles | 2 ¹ / ₂ " Space 6 Boss | | 2 ³ / ₄ " Space 8 Boss | | 2 ³ / ₄ " Space 6 Boss | | 3" Space 6 Boss | | 3 ¹ / ₄ " Space 6 Boss | | 3 ¹ / ₂ " Space 6 Boss | | 3 ³ / ₄ " Space 6 Boss | | 4" Space 6 Boss | | 4 ¹ / ₂ " Space 4 Boss | | 4 ¹ / ₂ " Space 4 Boss | |
|--------------------|--|--------------------------------|--|--------------------------------|--|--------------------------------|-----------------|-------------------------------|--|--------------------------------|--|--------------------------------|--|--------------------------------|-----------------|-------------------------------|--|--------------------------------|--|-------------------------------|
| | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. |
| 112 | | | 14 | 11 ³ / ₄ | | | | | | | | | | | | | 22 | 6 ³ / ₄ | 23 | 8 ³ / ₄ |
| 120 | 15 | 2 ³ / ₄ | | | 16 | 5 ³ / ₄ | 17 | 8 ³ / ₄ | 18 | 11 ³ / ₄ | 20 | 2 ³ / ₄ | 21 | 5 ³ / ₄ | 22 | 8 ³ / ₄ | 23 | 11 ³ / ₄ | 25 | 2 ³ / ₄ |
| 128 | | | 16 | 8 ³ / ₄ | | | | | | | | | | | | | 25 | 4 ³ / ₄ | 26 | 8 ³ / ₄ |
| 132 | 16 | 5 ³ / ₄ | | | 17 | 10 ¹ / ₄ | 19 | 2 ³ / ₄ | 20 | 7 ¹ / ₄ | 21 | 11 ³ / ₄ | 23 | 4 ³ / ₄ | 24 | 8 ³ / ₄ | | | | |
| 136 | | | | | | | | | | | | | | | | | 26 | 9 ³ / ₄ | 28 | 3 ⁴ / ₄ |
| 144 | 17 | 8 ³ / ₄ | 18 | 5 ³ / ₄ | 19 | 2 ³ / ₄ | 20 | 8 ³ / ₄ | 22 | 2 ³ / ₄ | 23 | 8 ³ / ₄ | 25 | 2 ³ / ₄ | 26 | 8 ³ / ₄ | 28 | 2 ³ / ₄ | 29 | 8 ³ / ₄ |
| 152 | | | | | | | | | | | | | | | | | 29 | 7 ³ / ₄ | 31 | 2 ³ / ₄ |
| 156 | 18 | 11 ³ / ₄ | | | 20 | 7 ¹ / ₄ | 22 | 2 ³ / ₄ | 23 | 10 ¹ / ₄ | 25 | 5 ³ / ₄ | 27 | 1 ³ / ₄ | 28 | 8 ³ / ₄ | | | | |
| 160 | | | 20 | 2 ³ / ₄ | | | | | | | | | | | | | 31 | 3 ⁴ / ₄ | 32 | 8 ³ / ₄ |
| 168 | 20 | 2 ³ / ₄ | | | 21 | 1 ³ / ₄ | 23 | 8 ³ / ₄ | 25 | 5 ³ / ₄ | 27 | 2 ³ / ₄ | 28 | 11 ³ / ₄ | 30 | 8 ³ / ₄ | 32 | 5 ³ / ₄ | 34 | 2 ³ / ₄ |
| 176 | | | 21 | 11 ³ / ₄ | | | | | | | | | | | | | 33 | 10 ³ / ₄ | 35 | 8 ³ / ₄ |
| 180 | 21 | 5 ³ / ₄ | | | 22 | 9 ³ / ₄ | 25 | 2 ³ / ₄ | 27 | 1 ³ / ₄ | 28 | 11 ³ / ₄ | 30 | 10 ¹ / ₄ | 32 | 8 ³ / ₄ | | | | |
| 184 | | | | | | | | | | | | | | | | | 35 | 3 ³ / ₄ | 37 | 2 ³ / ₄ |
| 192 | 22 | 8 ³ / ₄ | 23 | 8 ³ / ₄ | 24 | 8 ³ / ₄ | 26 | 8 ³ / ₄ | 28 | 8 ³ / ₄ | 30 | 8 ³ / ₄ | 32 | 8 ³ / ₄ | 34 | 8 ³ / ₄ | 36 | 8 ³ / ₄ | 38 | 8 ³ / ₄ |
| 200 | | | | | | | | | | | | | | | | | 38 | 1 ³ / ₄ | 40 | 2 ³ / ₄ |
| 204 | 23 | 11 ³ / ₄ | | | 26 | 1 ³ / ₄ | 28 | 2 ³ / ₄ | 30 | 4 ³ / ₄ | 32 | 5 ³ / ₄ | 34 | 7 ³ / ₄ | 36 | 8 ³ / ₄ | | | | |
| 208 | | | 25 | 5 ³ / ₄ | | | | | | | | | | | | | 39 | 6 ³ / ₄ | 41 | 8 ³ / ₄ |
| 216 | 25 | 2 ³ / ₄ | | | 27 | 5 ³ / ₄ | 29 | 8 ³ / ₄ | 31 | 11 ³ / ₄ | 34 | 2 ³ / ₄ | 36 | 5 ³ / ₄ | 38 | 8 ³ / ₄ | 40 | 11 ³ / ₄ | 43 | 2 ³ / ₄ |
| 224 | | | 27 | 2 ³ / ₄ | | | | | | | | | | | | | 42 | 4 ³ / ₄ | 44 | 7 ³ / ₄ |
| 228 | 26 | 5 ³ / ₄ | | | 28 | 10 ¹ / ₄ | 31 | 2 ³ / ₄ | 33 | 7 ¹ / ₄ | 35 | 11 ³ / ₄ | 38 | 4 ³ / ₄ | 40 | 8 ³ / ₄ | | | | |
| 232 | | | | | | | | | | | | | | | | | 43 | 9 ³ / ₄ | 46 | 2 ³ / ₄ |
| 240 | 27 | 8 ³ / ₄ | 28 | 11 ³ / ₄ | 30 | 2 ³ / ₄ | 32 | 8 ³ / ₄ | 35 | 2 ³ / ₄ | 37 | 8 ³ / ₄ | 40 | 2 ³ / ₄ | 42 | 8 ³ / ₄ | 45 | 2 ³ / ₄ | 47 | 8 ³ / ₄ |
| 248 | | | | | | | | | | | | | | | | | 46 | 5 ³ / ₄ | 49 | 2 ³ / ₄ |
| 252 | 28 | 11 ³ / ₄ | | | 31 | 8 ³ / ₄ | 34 | 2 ³ / ₄ | 36 | 10 ¹ / ₄ | 39 | 5 ³ / ₄ | 42 | 1 ³ / ₄ | 44 | 8 ³ / ₄ | | | | |
| 256 | | | 30 | 8 ³ / ₄ | | | | | | | | | | | | | 48 | 3 ⁴ / ₄ | 50 | 8 ³ / ₄ |
| 264 | 30 | 2 ³ / ₄ | | | 32 | 11 ³ / ₄ | 35 | 8 ³ / ₄ | 38 | 5 ³ / ₄ | 41 | 2 ³ / ₄ | 43 | 11 ³ / ₄ | 46 | 8 ³ / ₄ | 49 | 5 ³ / ₄ | 52 | 2 ³ / ₄ |
| 272 | | | 32 | 5 ³ / ₄ | | | | | | | | | | | | | 50 | 10 ³ / ₄ | 53 | 8 ³ / ₄ |
| 276 | 31 | 5 ³ / ₄ | | | 34 | 4 ³ / ₄ | 37 | 2 ³ / ₄ | 40 | 1 ³ / ₄ | 42 | 11 ³ / ₄ | 45 | 10 ¹ / ₄ | 48 | 8 ³ / ₄ | | | | |
| 280 | | | | | | | | | | | | | | | | | 52 | 3 ³ / ₄ | | |
| 288 | 32 | 8 ³ / ₄ | 34 | 2 ³ / ₄ | 35 | 8 ³ / ₄ | 38 | 8 ³ / ₄ | 41 | 8 ³ / ₄ | 44 | 8 ³ / ₄ | 47 | 8 ³ / ₄ | 50 | 8 ³ / ₄ | 53 | 8 ³ / ₄ | | |
| 296 | | | | | | | | | | | | | | | | | | | | |
| 300 | 33 | 11 ³ / ₄ | | | 37 | 1 ³ / ₄ | 40 | 2 ³ / ₄ | 43 | 4 ³ / ₄ | 46 | 3 ³ / ₄ | 49 | 7 ³ / ₄ | 52 | 8 ³ / ₄ | | | | |
| 304 | | | 35 | 11 ³ / ₄ | | | | | | | | | | | | | | | | |
| 312 | 35 | 2 ³ / ₄ | | | 38 | 5 ³ / ₄ | 41 | 8 ³ / ₄ | 44 | 11 ³ / ₄ | 47 | 11 ³ / ₄ | 51 | 5 ³ / ₄ | 54 | 8 ³ / ₄ | | | | |
| 320 | | | 37 | 8 ³ / ₄ | | | | | | | | | | | | | | | | |
| 324 | 36 | 5 ³ / ₄ | | | 39 | 10 ¹ / ₄ | 43 | 2 ³ / ₄ | 46 | 7 ¹ / ₄ | 49 | 11 ³ / ₄ | 53 | 4 ³ / ₄ | | | | | | |
| 336 | 37 | 8 ³ / ₄ | 39 | 5 ³ / ₄ | 41 | 2 ³ / ₄ | 44 | 8 ³ / ₄ | 48 | 2 ³ / ₄ | 51 | 8 ³ / ₄ | | | | | | | | |
| 348 | 38 | 11 ³ / ₄ | | | 42 | 7 ¹ / ₄ | 46 | 2 ³ / ₄ | 49 | 10 ¹ / ₄ | 53 | 5 ³ / ₄ | | | | | | | | |
| 352 | | | 41 | 2 ³ / ₄ | | | | | | | | | | | | | | | | |
| 360 | 40 | 2 ³ / ₄ | | | 43 | 11 ³ / ₄ | 47 | 8 ³ / ₄ | 51 | 5 ³ / ₄ | | | | | | | | | | |
| 368 | | | 42 | 11 ³ / ₄ | | | | | | | | | | | | | | | | |
| 372 | 41 | 5 ³ / ₄ | | | 45 | 4 ³ / ₄ | 49 | 2 ³ / ₄ | 53 | 1 ³ / ₄ | | | | | | | | | | |
| 384 | 42 | 8 ³ / ₄ | 44 | 8 ³ / ₄ | 46 | 8 ³ / ₄ | | | | | | | | | | | | | | |
| 396 | 43 | 11 ³ / ₄ | | | 48 | 1 ³ / ₄ | 52 | 2 ³ / ₄ | | | | | | | | | | | | |
| 400 | | | 46 | 5 ³ / ₄ | | | | | | | | | | | | | | | | |
| 408 | 45 | 2 ³ / ₄ | | | 49 | 5 ³ / ₄ | 53 | 8 ³ / ₄ | | | | | | | | | | | | |
| 416 | | | 48 | 2 ³ / ₄ | | | | | | | | | | | | | | | | |
| 420 | 46 | 5 ³ / ₄ | | | 50 | 10 ¹ / ₄ | | | | | | | | | | | | | | |
| 432 | 47 | 8 ³ / ₄ | 49 | 11 ³ / ₄ | | | | | | | | | | | | | | | | |
| 444 | 48 | 11 ³ / ₄ | | | 53 | 7 ¹ / ₄ | | | | | | | | | | | | | | |
| 448 | | | 51 | 8 ³ / ₄ | | | | | | | | | | | | | | | | |
| 456 | 50 | 2 ³ / ₄ | | | | | | | | | | | | | | | | | | |
| 464 | | | 53 | 5 ³ / ₄ | | | | | | | | | | | | | | | | |
| 468 | 51 | 5 ³ / ₄ | | | | | | | | | | | | | | | | | | |
| 480 | 52 | 8 ³ / ₄ | 55 | 2 ³ / ₄ | | | | | | | | | | | | | | | | |
| 492 | 53 | 11 ³ / ₄ | | | | | | | | | | | | | | | | | | |
| 496 | | | 56 | 11 ³ / ₄ | | | | | | | | | | | | | | | | |
| 504 | 55 | 2 ³ / ₄ | | | | | | | | | | | | | | | | | | |
| 512 | | | 58 | 8 ³ / ₄ | | | | | | | | | | | | | | | | |

BAND DRIVE SPINNING

Speed Table

Giving Revolutions per Minute of 7 inch Cylinder Required to
Produce Various Spindle Speeds.

| R.P.M. OF SPINDLES | Revolutions per Minute of 7 inch Cylinder with | | | | | | |
|-----------------------|--|--|--|--|--|---|---|
| | $\frac{3}{4}$ inch Whirl Ratio 8.33 | $\frac{13}{16}$ inch Whirl Ratio 7.48 | $\frac{1}{2}$ inch Whirl Ratio 7.25 | $\frac{13}{16}$ inch Whirl Ratio 6.62 | $\frac{1}{2}$ inch Whirl Ratio 6.24 | $\frac{1}{16}$ inch Whirl Ratio 5.86 | $\frac{1}{16}$ inch Whirl Ratio 5.43 |
| 4000 | | | | | | 683 | 833 |
| 4100 | | | | | | 700 | 854 |
| 4200 | | | | | | 717 | 875 |
| 4300 | | | | | | 734 | 896 |
| 4400 | | | | | | 751 | 917 |
| 4500 | | | | | 721 | 768 | 938 |
| 4600 | | | | | 737 | 785 | 958 |
| 4700 | | | | | 753 | 802 | 979 |
| 4800 | | | | | 769 | 819 | 1000 |
| 4900 | | | | | 781 | 836 | 1021 |
| 5000 | | | | 755 | 801 | 853 | 1042 |
| 5100 | | | | 770 | 817 | 870 | 1063 |
| 5200 | | | | 785 | 833 | 887 | 1083 |
| 5300 | | | | 801 | 849 | 904 | 1104 |
| 5400 | | | | 816 | 865 | 921 | 1125 |
| 5500 | | | 759 | 831 | 881 | 938 | 1013 |
| 5600 | | | 772 | 846 | 897 | 956 | 1031 |
| 5700 | | | 786 | 861 | 913 | 973 | 1050 |
| 5800 | | | 800 | 876 | 929 | 990 | 1068 |
| 5900 | | | 814 | 891 | 946 | 1007 | 1087 |
| 6000 | | 781 | 828 | 906 | 962 | 1024 | 1105 |
| 6100 | | 794 | 841 | 921 | 978 | 1041 | 1123 |
| 6200 | | 807 | 855 | 936 | 994 | 1058 | 1142 |
| 6300 | | 820 | 869 | 952 | 1010 | 1075 | 1160 |
| 6400 | | 833 | 883 | 967 | 1026 | 1092 | 1179 |
| 6500 | 780 | 846 | 897 | 982 | 1042 | 1109 | 1197 |
| 6600 | 792 | 859 | 910 | 997 | 1058 | 1126 | 1215 |
| 6700 | 804 | 872 | 924 | 1012 | 1074 | 1143 | 1234 |
| 6800 | 816 | 885 | 938 | 1027 | 1090 | 1160 | 1252 |
| 6900 | 828 | 898 | 952 | 1042 | 1106 | 1177 | 1271 |
| 7000 | 840 | 911 | 966 | 1057 | 1122 | 1195 | 1289 |
| 7100 | 852 | 924 | 979 | 1072 | 1138 | 1212 | 1308 |
| 7200 | 864 | 937 | 993 | 1088 | 1154 | 1229 | 1326 |
| 7300 | 876 | 950 | 1007 | 1103 | 1170 | 1246 | 1344 |
| 7400 | 888 | 963 | 1021 | 1118 | 1186 | 1263 | 1363 |
| 7500 | 900 | 976 | 1034 | 1133 | 1202 | 1280 | 1381 |
| 7600 | 912 | 989 | 1048 | 1148 | 1218 | 1297 | 1400 |
| 7700 | 924 | 1002 | 1062 | 1163 | 1234 | 1314 | 1418 |
| 7800 | 936 | 1015 | 1076 | 1178 | 1250 | 1331 | 1436 |
| 7900 | 948 | 1028 | 1090 | 1193 | 1266 | 1348 | 1455 |

BAND DRIVE SPINNING

Speed Table

Giving Revolutions per Minute of 7 inch Cylinder Required to
Produce Various Spindle Speeds.

| R.P.M. OF SPINDLES | Revolutions per Minute of 7 inch Cylinder with | | | | | | |
|-----------------------|--|--|--|--|----------------------------|--|---|
| | $\frac{3}{4}$ inch Whirl Ratio 8.33 | $\frac{11}{16}$ inch Whirl Ratio 7.68 | $\frac{7}{8}$ inch Whirl Ratio 7.25 | $\frac{15}{16}$ inch Whirl Ratio 6.62 | 1 inch Whirl Ratio 6.24 | $1\frac{1}{16}$ inch Whirl Ratio 5.86 | $1\frac{1}{8}$ inch Whirl Ratio 5.43 |
| 8000 | 960 | 1041 | 1103 | 1208 | 1282 | 1365 | |
| 8100 | 972 | 1054 | 1117 | 1223 | 1298 | 1382 | 1473 |
| 8200 | 984 | 1067 | 1131 | 1239 | 1314 | 1399 | 1491 |
| 8300 | 996 | 1080 | 1145 | 1254 | 1330 | 1416 | 1509 |
| 8400 | 1008 | 1093 | 1159 | 1269 | 1346 | 1433 | 1527 |
| 8500 | 1020 | 1106 | 1172 | 1284 | 1362 | 1450 | 1545 |
| 8600 | 1032 | 1119 | 1186 | 1299 | 1378 | 1467 | |
| 8700 | 1044 | 1132 | 1200 | 1314 | 1394 | 1484 | |
| 8800 | 1056 | 1145 | 1214 | 1329 | 1410 | 1501 | |
| 8900 | 1068 | 1158 | 1228 | 1344 | 1426 | 1518 | |
| 9000 | 1080 | 1171 | 1241 | 1360 | 1442 | | |
| 9100 | 1092 | 1184 | 1255 | 1375 | 1458 | | |
| 9200 | 1104 | 1197 | 1269 | 1390 | 1474 | | |
| 9300 | 1116 | 1210 | 1283 | 1405 | 1490 | | |
| 9400 | 1128 | 1223 | 1297 | 1420 | 1506 | | |
| 9500 | 1140 | 1236 | 1310 | 1435 | | | |
| 9600 | 1152 | 1249 | 1324 | 1450 | | | |
| 9700 | 1164 | 1262 | 1338 | 1465 | | | |
| 9800 | 1176 | 1275 | 1352 | 1480 | | | |
| 9900 | 1188 | 1288 | 1366 | 1495 | | | |
| 10000 | 1200 | 1301 | 1379 | | | | |
| 10100 | 1212 | 1314 | 1393 | | | | |
| 10200 | 1224 | 1327 | 1407 | | | | |
| 10300 | 1236 | 1340 | 1421 | | | | |
| 10400 | 1248 | 1353 | 1435 | | | | |
| 10500 | 1260 | 1366 | 1449 | | | | |
| 10600 | 1272 | 1379 | 1463 | | | | |
| 10700 | 1284 | 1392 | 1477 | | | | |
| 10800 | 1296 | 1405 | 1491 | | | | |
| 10900 | 1308 | 1418 | 1505 | | | | |
| 11000 | 1320 | 1431 | | | | | |
| 11100 | 1332 | 1444 | | | | | |
| 11200 | 1344 | 1457 | | | | | |
| 11300 | 1356 | 1470 | | | | | |
| 11400 | 1368 | 1483 | | | | | |
| 11500 | 1380 | | | | | | |
| 11600 | 1392 | | | | | | |
| 11700 | 1404 | | | | | | |
| 11800 | 1416 | | | | | | |
| 11900 | 1428 | | | | | | |
| 12000 | 1440 | | | | | | |

BAND DRIVE SPINNING

Speed Table

Giving Revolutions per Minute of 8 inch Cylinder Required to
Produce Various Spindle Speeds.

| R.P.M. OF SPINDLES | Revolutions per Minute of 8 inch Cylinder with | | | | | | |
|-----------------------|--|--|--|--|------------------------------|---|---|
| | $\frac{3}{8}$ inch Whirl Ratio 9.52 | $\frac{11}{16}$ inch Whirl Ratio 8.91 | $\frac{1}{2}$ inch Whirl Ratio 8.28 | $\frac{13}{16}$ inch Whirl Ratio 7.67 | 1 inch Whirl Ratio 7.08 | $1\frac{1}{8}$ inch Whirl Ratio 6.80 | $1\frac{1}{4}$ inch Whirl Ratio 6.22 |
| 4000 | | | | | | 588 | 643 |
| 4100 | | | | | | 603 | 659 |
| 4200 | | | | | | 618 | 675 |
| 4300 | | | | | | 632 | 691 |
| 4400 | | | | | | 647 | 707 |
| 4500 | | | | | 636 | 662 | 723 |
| 4600 | | | | | 650 | 676 | 740 |
| 4700 | | | | | 664 | 691 | 756 |
| 4800 | | | | | 678 | 706 | 772 |
| 4900 | | | | | 692 | 721 | 788 |
| 5000 | | | | 652 | 706 | 735 | 804 |
| 5100 | | | | 665 | 720 | 750 | 820 |
| 5200 | | | | 678 | 734 | 765 | 836 |
| 5300 | | | | 691 | 749 | 779 | 852 |
| 5400 | | | | 704 | 761 | 794 | 868 |
| 5500 | | | 664 | 717 | 777 | 809 | 884 |
| 5600 | | | 676 | 730 | 791 | 824 | 900 |
| 5700 | | | 688 | 743 | 805 | 838 | 916 |
| 5800 | | | 700 | 756 | 819 | 853 | 932 |
| 5900 | | | 712 | 769 | 833 | 868 | 949 |
| 6000 | | 673 | 725 | 782 | 847 | 882 | 965 |
| 6100 | | 684 | 737 | 795 | 862 | 897 | 981 |
| 6200 | | 695 | 748 | 808 | 876 | 912 | 997 |
| 6300 | | 706 | 761 | 821 | 890 | 926 | 1013 |
| 6400 | | 717 | 773 | 834 | 904 | 941 | 1029 |
| 6500 | 683 | 728 | 785 | 847 | 918 | 956 | 1045 |
| 6600 | 693 | 739 | 797 | 860 | 932 | 971 | 1061 |
| 6700 | 704 | 750 | 809 | 874 | 946 | 985 | 1077 |
| 6800 | 714 | 761 | 821 | 887 | 961 | 1000 | 1093 |
| 6900 | 724 | 772 | 833 | 900 | 975 | 1014 | 1109 |
| 7000 | 734 | 783 | 845 | 913 | 989 | 1029 | 1125 |
| 7100 | 744 | 794 | 857 | 926 | 1003 | 1044 | 1141 |
| 7200 | 754 | 805 | 870 | 939 | 1017 | 1059 | 1158 |
| 7300 | 764 | 816 | 882 | 952 | 1031 | 1074 | 1172 |
| 7400 | 774 | 827 | 894 | 965 | 1045 | 1088 | 1190 |
| 7500 | 784 | 838 | 906 | 978 | 1059 | 1103 | 1206 |
| 7600 | 794 | 849 | 918 | 991 | 1073 | 1118 | 1222 |
| 7700 | 804 | 860 | 930 | 1004 | 1088 | 1132 | 1238 |
| 7800 | 814 | 871 | 942 | 1017 | 1102 | 1147 | 1254 |
| 7900 | 824 | 882 | 954 | 1030 | 1116 | 1162 | 1270 |

BAND DRIVE SPINNING

Speed Table

Giving Revolutions per Minute of 8 Inch Cylinder Required to
Produce Various Spindle Speeds.

| R.P.M. OF SPINDLES | Revolutions per Minute of 8 inch Cylinder with | | | | | | |
|-----------------------|--|--|--|--|----------------------------|--|---|
| | $\frac{3}{4}$ inch Whirl Ratio 9.52 | $\frac{11}{16}$ inch Whirl Ratio 8.91 | $\frac{7}{8}$ inch Whirl Ratio 8.28 | $\frac{13}{16}$ inch Whirl Ratio 7.67 | 1 inch Whirl Ratio 7.08 | $1\frac{1}{16}$ inch Whirl Ratio 6.80 | $1\frac{1}{8}$ inch Whirl Ratio 6.22 |
| 8000 | 840 | 898 | 966 | 1043 | 1130 | 1176 | 1286 |
| 8100 | 851 | 909 | 978 | 1056 | 1144 | 1191 | 1302 |
| 8200 | 862 | 921 | 990 | 1069 | 1158 | 1206 | 1318 |
| 8300 | 872 | 932 | 1002 | 1082 | 1172 | 1221 | 1334 |
| 8400 | 882 | 943 | 1014 | 1095 | 1186 | 1235 | 1350 |
| 8500 | 893 | 954 | 1027 | 1108 | 1201 | 1250 | 1367 |
| 8600 | 904 | 965 | 1039 | 1121 | 1215 | 1265 | 1383 |
| 8700 | 915 | 976 | 1051 | 1134 | 1229 | 1279 | 1399 |
| 8800 | 925 | 988 | 1063 | 1147 | 1243 | 1294 | 1415 |
| 8900 | 935 | 999 | 1075 | 1160 | 1257 | 1309 | 1431 |
| 9000 | 945 | 1010 | 1087 | 1173 | 1271 | 1324 | |
| 9100 | 956 | 1021 | 1099 | 1186 | 1285 | 1338 | |
| 9200 | 966 | 1032 | 1111 | 1199 | 1299 | 1353 | |
| 9300 | 977 | 1044 | 1123 | 1213 | 1314 | 1368 | |
| 9400 | 988 | 1055 | 1135 | 1226 | 1328 | 1382 | |
| 9500 | 998 | 1066 | 1147 | 1239 | 1342 | | |
| 9600 | 1009 | 1077 | 1159 | 1252 | 1356 | | |
| 9700 | 1019 | 1088 | 1171 | 1265 | 1370 | | |
| 9800 | 1029 | 1100 | 1183 | 1278 | 1384 | | |
| 9900 | 1040 | 1111 | 1195 | 1291 | 1398 | | |
| 10000 | 1050 | 1122 | 1208 | 1304 | | | |
| 10100 | 1061 | 1133 | 1220 | 1317 | | | |
| 10200 | 1071 | 1144 | 1232 | 1330 | | | |
| 10300 | 1082 | 1156 | 1244 | 1343 | | | |
| 10400 | 1092 | 1167 | 1256 | 1356 | | | |
| 10500 | 1103 | 1178 | 1268 | | | | |
| 10600 | 1113 | 1189 | 1280 | | | | |
| 10700 | 1124 | 1200 | 1292 | | | | |
| 10800 | 1134 | 1212 | 1304 | | | | |
| 10900 | 1144 | 1223 | 1316 | | | | |
| 11000 | 1155 | 1235 | | | | | |
| 11100 | 1166 | 1246 | | | | | |
| 11200 | 1176 | 1257 | | | | | |
| 11300 | 1187 | 1269 | | | | | |
| 11400 | 1197 | 1280 | | | | | |
| 11500 | 1208 | | | | | | |
| 11600 | 1219 | | | | | | |
| 11700 | 1229 | | | | | | |
| 11800 | 1240 | | | | | | |
| 11900 | 1250 | | | | | | |
| 12000 | 1261 | | | | | | |

TAPE DRIVE SPINNING

SPEED TABLE

Giving Revolutions per Minute of Cylinder Required to Produce Various
 8 inch Cylinder Spindle Speeds 7 inch Cylinder

| R. P. M. OF SPINDLES | Revolutions per Minute of Cylinder with | | | | | | Revolutions per Minute of Cylinder with | | | | | |
|-------------------------|--|--|---------------------------|--|--------------------------------------|--|--|---|----------------------------|---|---|---|
| | $\frac{3}{8}$ inch Whirl Ratio 8.8 | $1\frac{1}{8}$ inch Whirl Ratio 8.3 | 1 inch Whirl Ratio 7.8 | $1\frac{1}{4}$ inch Whirl Ratio 7.3 | $1\frac{1}{2}$ inch Whirl Ratio 7 | $1\frac{5}{8}$ inch Whirl Ratio 5.9 | $\frac{3}{8}$ inch Whirl Ratio 7.8 | $1\frac{1}{8}$ inch Whirl Ratio 7.27 | 1 inch Whirl Ratio 6.81 | $1\frac{1}{4}$ inch Whirl Ratio 6.43 | $1\frac{1}{2}$ inch Whirl Ratio 6.09 | $1\frac{5}{8}$ inch Whirl Ratio 5.22 |
| 4000 | ... | ... | ... | 548 | 511 | 678 | ... | ... | ... | 622 | 657 | 766 |
| 4100 | ... | ... | ... | 561 | 586 | 695 | ... | ... | ... | 637 | 674 | 785 |
| 4200 | ... | ... | ... | 575 | 600 | 711 | ... | ... | ... | 653 | 690 | 804 |
| 4300 | ... | ... | ... | 589 | 614 | 728 | ... | ... | ... | 668 | 706 | 823 |
| 4400 | ... | ... | ... | 603 | 628 | 745 | ... | ... | ... | 684 | 722 | 842 |
| 4500 | ... | ... | 577 | 616 | 643 | 762 | ... | ... | 661 | 699 | 739 | 861 |
| 4600 | ... | ... | 590 | 630 | 657 | 779 | ... | ... | 676 | 715 | 756 | 881 |
| 4700 | ... | ... | 602 | 644 | 671 | 796 | ... | ... | 691 | 731 | 773 | 900 |
| 4800 | ... | ... | 615 | 657 | 686 | 812 | ... | ... | 704 | 746 | 788 | 919 |
| 4900 | ... | ... | 628 | 671 | 700 | 830 | ... | ... | 720 | 762 | 804 | 938 |
| 5000 | ... | 602 | 641 | 685 | 714 | 847 | ... | 688 | 735 | 777 | 821 | 957 |
| 5100 | ... | 614 | 654 | 698 | 728 | 864 | ... | 701 | 750 | 792 | 838 | 976 |
| 5200 | ... | 627 | 667 | 712 | 742 | 881 | ... | 715 | 765 | 808 | 854 | 996 |
| 5300 | ... | 639 | 680 | 726 | 757 | 898 | ... | 729 | 779 | 824 | 871 | 1015 |
| 5400 | ... | 651 | 692 | 740 | 771 | 915 | ... | 742 | 794 | 840 | 888 | 1034 |
| 5500 | 625 | 662 | 704 | 753 | 785 | 932 | 705 | 756 | 809 | 855 | 904 | 1053 |
| 5600 | 636 | 674 | 718 | 767 | 800 | 949 | 718 | 770 | 824 | 871 | 920 | 1071 |
| 5700 | 648 | 687 | 730 | 781 | 814 | 966 | 730 | 784 | 838 | 886 | 937 | 1091 |
| 5800 | 659 | 698 | 743 | 794 | 828 | 983 | 743 | 798 | 852 | 902 | 953 | 1111 |
| 5900 | 670 | 710 | 756 | 806 | 842 | 1000 | 756 | 811 | 867 | 917 | 970 | 1121 |
| 6000 | 682 | 723 | 769 | 821 | 857 | 1017 | 769 | 825 | 882 | 932 | 986 | 1145 |
| 6100 | 693 | 734 | 782 | 836 | 871 | 1034 | 782 | 839 | 897 | 948 | 1002 | 1164 |
| 6200 | 704 | 746 | 794 | 849 | 885 | 1050 | 795 | 852 | 911 | 964 | 1019 | 1184 |
| 6300 | 716 | 759 | 808 | 863 | 900 | 1067 | 808 | 866 | 926 | 980 | 1035 | 1204 |
| 6400 | 728 | 770 | 820 | 876 | 914 | 1084 | 820 | 880 | 941 | 995 | 1052 | 1223 |
| 6500 | 739 | 783 | 833 | 890 | 928 | 1101 | 833 | 893 | 955 | 1011 | 1069 | 1243 |
| 6600 | 750 | 795 | 846 | 903 | 943 | 1118 | 846 | 906 | 970 | 1024 | 1085 | 1262 |
| 6700 | 761 | 807 | 859 | 918 | 957 | 1135 | 858 | 921 | 985 | 1041 | 1100 | 1282 |
| 6800 | 773 | 819 | 872 | 931 | 971 | 1152 | 872 | 934 | 1000 | 1055 | 1117 | 1301 |
| 6900 | 784 | 831 | 885 | 945 | 986 | 1169 | 884 | 947 | 1014 | 1072 | 1134 | 1321 |
| 7000 | 795 | 843 | 897 | 959 | 1000 | 1186 | 897 | 962 | 1029 | 1085 | 1150 | 1341 |
| 7100 | 806 | 855 | 910 | 972 | 1014 | 1203 | 910 | 975 | 1044 | 1103 | 1167 | 1360 |
| 7200 | 817 | 867 | 922 | 986 | 1028 | 1220 | 922 | 990 | 1058 | 1116 | 1184 | 1375 |
| 7300 | 828 | 879 | 936 | 1000 | 1043 | 1237 | 935 | 1002 | 1073 | 1133 | 1200 | 1394 |
| 7400 | 841 | 891 | 949 | 1013 | 1057 | 1254 | 948 | 1016 | 1088 | 1150 | 1216 | 1414 |
| 7500 | 852 | 903 | 961 | 1025 | 1071 | 1271 | 961 | 1031 | 1103 | 1164 | 1233 | |
| 7600 | 864 | 916 | 974 | 1040 | 1085 | 1288 | 974 | 1044 | 1117 | 1181 | 1249 | |
| 7700 | 875 | 928 | 987 | 1054 | 1100 | 1305 | 987 | 1057 | 1132 | 1195 | 1266 | |
| 7800 | 886 | 940 | 1000 | 1066 | 1114 | 1322 | 1000 | 1072 | 1147 | 1212 | 1283 | |
| 7900 | 898 | 952 | 1013 | 1082 | 1128 | 1339 | 1013 | 1085 | 1162 | 1226 | 1299 | |

TAPE DRIVE SPINNING

SPEED TABLE

Giving Revolutions per Minute of Cylinder Required to Produce Various
8 inch Cylinder Spindle Speeds 7 inch Cylinder

| R. P. M. OF SPINDLES | Revolutions per Minute of Cylinder with | | | | | | Revolutions per Minute of Cylinder with | | | | | |
|-------------------------|--|---------------------------------------|---------------------------|--|--------------------------------------|--|--|--|----------------------------|---|---|---|
| | $\frac{3}{8}$ inch Whirl Ratio 8.8 | $\frac{1}{2}$ inch Whirl Ratio 8.3 | 1 inch Whirl Ratio 7.8 | $1\frac{1}{8}$ inch Whirl Ratio 7.3 | $1\frac{1}{2}$ inch Whirl Ratio 7 | $1\frac{3}{4}$ inch Whirl Ratio 5.9 | $\frac{3}{8}$ inch Whirl Ratio 7.8 | $\frac{1}{2}$ inch Whirl Ratio 7.27 | 1 inch Whirl Ratio 6.81 | $1\frac{1}{8}$ inch Whirl Ratio 6.43 | $1\frac{1}{2}$ inch Whirl Ratio 6.09 | $1\frac{3}{4}$ inch Whirl Ratio 5.22 |
| 8000 | 908 | 964 | 1026 | 1096 | 1142 | | 1026 | 1100 | 1176 | 1242 | 1316 | |
| 8100 | 920 | 976 | 1038 | 1110 | 1157 | | 1038 | 1113 | 1191 | 1256 | 1333 | |
| 8200 | 932 | 988 | 1051 | 1123 | 1171 | | 1051 | 1126 | 1206 | 1273 | 1349 | |
| 8300 | 943 | 1000 | 1064 | 1137 | 1185 | | 1064 | 1141 | 1220 | 1290 | 1364 | |
| 8400 | 954 | 1012 | 1076 | 1151 | 1200 | | 1077 | 1154 | 1235 | 1304 | 1381 | |
| 8500 | 966 | 1024 | 1089 | 1164 | 1214 | | 1090 | 1167 | 1250 | 1321 | | |
| 8600 | 977 | 1036 | 1102 | 1178 | 1228 | | 1102 | 1182 | 1264 | 1335 | | |
| 8700 | 989 | 1048 | 1115 | 1192 | 1243 | | 1115 | 1195 | 1279 | 1352 | | |
| 8800 | 1000 | 1060 | 1128 | 1204 | 1257 | | 1128 | 1210 | 1294 | 1365 | | |
| 8900 | 1010 | 1072 | 1141 | 1219 | 1271 | | 1141 | 1223 | 1309 | 1382 | | |
| 9000 | 1022 | 1084 | 1154 | 1233 | | | 1154 | 1236 | 1323 | | | |
| 9100 | 1034 | 1096 | 1167 | 1247 | | | 1167 | 1251 | 1338 | | | |
| 9200 | 1045 | 1108 | 1179 | 1260 | | | 1179 | 1264 | 1353 | | | |
| 9300 | 1057 | 1120 | 1192 | 1274 | | | 1192 | 1276 | 1367 | | | |
| 9400 | 1068 | 1132 | 1205 | 1288 | | | 1205 | 1292 | 1382 | | | |
| 9500 | 1078 | 1144 | 1218 | | | | 1218 | 1304 | | | | |
| 9600 | 1091 | 1156 | 1231 | | | | 1231 | 1320 | | | | |
| 9700 | 1102 | 1169 | 1243 | | | | 1243 | 1333 | | | | |
| 9800 | 1114 | 1181 | 1256 | | | | 1256 | 1346 | | | | |
| 9900 | 1125 | 1193 | 1269 | | | | 1269 | 1361 | | | | |
| 10000 | 1136 | 1204 | | | | | 1282 | | | | | |
| 10100 | 1147 | 1216 | | | | | 1295 | | | | | |
| 10200 | 1159 | 1227 | | | | | 1308 | | | | | |
| 10300 | 1170 | 1241 | | | | | 1320 | | | | | |
| 10400 | 1182 | 1253 | | | | | 1333 | | | | | |
| 10500 | 1193 | | | | | | 1346 | | | | | |
| 10600 | 1204 | | | | | | 1359 | | | | | |
| 10700 | 1215 | | | | | | 1372 | | | | | |
| 10800 | 1227 | | | | | | 1384 | | | | | |
| 10900 | 1238 | | | | | | 1397 | | | | | |
| 11000 | 1250 | | | | | | | | | | | |
| 11100 | 1261 | | | | | | | | | | | |
| 11200 | 1272 | | | | | | | | | | | |
| 11300 | 1284 | | | | | | | | | | | |
| 11400 | 1295 | | | | | | | | | | | |

Traveller Table

For Whitin Ring Spinning Frames with Separators.

| Warp Yarn. | | | | | Filling Yarn. | | | | |
|-----------------|--------------------------|-------------------|----------------------|------------------------------------|-----------------|--------------------------|-------------------|----------------------|------------------------------------|
| Number of Yarn. | Revolutions of Spindles. | Diameter of Ring. | Number of Traveller. | Weight of 10 Travellers in grains. | Number of Yarn. | Revolutions of Spindles. | Diameter of Ring. | Number of Traveller. | Weight of 10 Travellers in grains. |
| 4 | 4950 | 2" | 14 | 39 | 4 | 4000 | 1 1/2" | 16 | 44 |
| 6 | 5900 | | 12 | 33 | 6 | 4800 | | 13 | 36 |
| 8 | 6700 | | 9 | 23 | 8 | 5450 | | 10 | 26 |
| 10 | 7250 | | 8 | 20 | 10 | 5950 | | 8 | 20 |
| 11 | 7500 | | 7 | 18 | 11 | 6150 | | 7 | 18 |
| 12 | 7750 | | 6 | 16 | 12 | 6350 | | 6 | 16 |
| 13 | 7950 | | 6 | 16 | 13 | 6500 | | 5 | 14 |
| 14 | 8100 | | 5 | 14 | 14 | 6700 | | 4 | 13 |
| 15 | 8300 | | 4 | 13 | 15 | 6850 | | 3 | 12 |
| 16 | 8450 | | 3 | 12 | 16 | 6950 | | 2 | 11 |
| 17 | 8600 | | 2 | 11 | 17 | 7100 | | 1 | 10 |
| 18 | 8750 | | 1 | 10 | 18 | 7200 | | 1-0 | 9 |
| 19 | 8850 | | 1-0 | 9 | 19 | 7300 | | 3-0 | 8 |
| 20 | 8900 | | 2-0 | 8 1/2 | 20 | 7400 | | 5-0 | 7 |
| 21 | 9050 | | 3-0 | 8 | 21 | 7500 | | 5-0 | |
| 22 | 9100 | | 4-0 | 7 1/2 | 22 | 7600 | | 6-0 | 6 1/2 |
| 23 | 9150 | | 5-0 | 7 | 23 | 7700 | | 6-0 | |
| 24 | 9200 | | 6-0 | 6 1/2 | 24 | 7800 | | 7-0 | 6 |
| 28 | 9500 | 1 3/4" | 7-0 | 6 | 28 | 7900 | 1 3/8" | 8-0 | 5 1/2 |
| 32 | 9500 | | 8-0 | 5 1/2 | 32 | 7900 | | 9-0 | 5 |
| 34 | 9600 | | 9-0 | 5 | 34 | 7900 | | 10-0 | 4 1/2 |
| 36 | 9700 | | 10-0 | 4 1/2 | 36 | 7900 | | 11-0 | 4 |
| 38 | 9800 | | 11-0 | 4 | 38 | 7900 | | 12-0 | 3 3/4 |
| 40 | 9700 | | 12-0 | 3 3/4 | 40 | 7900 | 1 1/4" | 13-0 | 3 1/2 |
| 45 | 9700 | | 13-0 | 3 1/2 | 45 | 7900 | | 14-0 | 3 1/4 |
| 50 | 9700 | | 14-0 | 3 1/4 | 50 | 7900 | | 15-0 | 3 |
| 55 | 9600 | | 14-0 | | 55 | 7900 | | 15-0 | |
| 60 | 9600 | | 15-0 | 3 | 60 | 7900 | | 16-0 | 2 3/4 |
| 65 | 9600 | | 15-0 | | 65 | 7800 | | 16-0 | |
| 70 | 9500 | | 16-0 | 2 3/4 | 70 | 7800 | | 17-0 | 2 1/2 |
| 75 | 9500 | | 16-0 | | 75 | 7800 | | 17-0 | |
| 80 | 9300 | | 17-0 | 2 1/2 | 80 | 7700 | | 18-0 | 2 1/4 |
| 85 | 9100 | | 17-0 | | 85 | 7600 | | 18-0 | |
| 90 | 9100 | 1 3/8" | 18-0 | 2 1/4 | 90 | 7400 | | 19-0 | 2 |
| 95 | 9000 | | 19-0 | 2 | 95 | 7400 | | 20-0 | 1 3/4 |
| 100 | 8700 | | 20-0 | 1 3/4 | 100 | 7200 | | 21-0 | 1 1/2 |
| 110 | 8500 | | 21-0 | 1 1/2 | 110 | 6900 | | 22-0 | 1 1/4 |

Sizes of Travellers will vary from the above table according to variations in speed, quality of cotton, etc., but the table may serve as a basis to select from. The higher the speed the lighter the traveller and vice versa, varying in proportion of one or two grades of travellers to each 1000 revolutions of spindle. Without separators a few grades heavier traveller would be required.

RULES FOR SPINNERS.

One pound is 7000 grains.

One lea is 120 yards long.

One hank is 840 yards long.

The number of the yarn is the number of hanks in one pound.

The hank roving divided by the doublings, and multiplied by the draught, equals the number of yarn.

To find hank roving from number of grains per yard:

Dividing 8.33 by the number of grains per yard, equals hank roving.

To find speed of front roll:

Divide revolutions per minute of spindle by the product of the twist per inch, multiplied by the circumference in inches of the front roll.

To find speed of spindles:

Multiply the revolutions of the cylinder by the ratio of speeds of the cylinder and spindle.

Method of finding the cylinder and spindle ratio:

On the foot end of the frame in which it is desired to find the speed ratio, mark with chalk coinciding points on both cylinder and frame. Also mark points in a like manner on the spindle whirl and frame adjacent thereto. Then slowly revolve the cylinder until the chalk marks on both the cylinder and spindle simultaneously coincide with their respective frame marks. With the aid of an assistant, the number of turns of both cylinder and spindle should be carefully taken. The turns of the spindle divided by the turns of the cylinder gives the ratio desired. To render the result as accurate as possible, the spindle should be driven by a band of a size and tension the same as is used under ordinary working conditions.

To find the standard twist per inch:

Multiply the square root of the number of yarn by —

| | | |
|------|-----|-----------------------|
| 4.75 | for | Frame Warp Yarns |
| 4. | for | Extra Mule Warp Yarns |
| 3.50 | for | Frame Filling Yarns |
| 3.25 | for | Mule Filling Yarns |
| 2.75 | for | Doubling Yarns |
| 2.50 | for | Mule Hosiery Yarns |
| 3. | for | frame “ “ |

Example.—What is the twist per inch of 25s frame warp yarn?

Answer.—The square root of 25 is 5; therefore, $5 \times 4.75 = 23.75$ turns per inch.

To find the draught:

Counts divided by hank roving equals the draught.

Example.— $24s \div 3$ hank = 8 draught.

To find hank roving:

Counts divided by draught equals hank roving.

Example.— $24s$ divided by 8 draught = 3 hank roving.

To find the counts:

Multiply length of yarn in yards by 8.33 and divide by weight in grains equals counts.

To find what per cent. yarn contracts in twisting:

Divide the number of yarn by the product of the draught and hank roving and subtract the quotient from 1.

Example.—No. 20s yarn is being spun from 3 hank roving with a draught of 6.87; then $6.87 \times 3 = 20.61$; $20 \div 20.61 = .97$; therefore, $1 - .97 = .03$ or 3%.

To find the draught in machine:

The product of the back roll gear, crown gear, and diameter in inches of the front roll, divided by the product of the front roll gear and diameter of the back roll equals the draught constant. Constant divided by change gear equals draught.

Example.—84 teeth back roll gear, 168 teeth crown gear, 1" diameter of front roll, 30 teeth front roll gear, $\frac{7}{8}$ " diameter back roll; what is the draught constant?

$$\frac{84 \times 168 \times 1}{30 \times \frac{7}{8}} = 537.60 = \text{Draught constant.}$$

To find what change draught gear will be required when changing from one number of yarn to another, without changing the roving:

Multiply the number of teeth in the change draught gear in use by the number of yarn spun. Dividing this product by the number of yarn desired will give the required change draught gear.

Example.—What change draught gear will be required to change from 24s yarn, spun from 3 hank roving using a 32 teeth change draught gear to 20s yarn?

$$32 \times 24 = 768; 768 \div 20 = 38 \text{ teeth change draught gear required.}$$

To find what change draught gear will be required when changing from one number of yarn to another, the draught and roving both being changed:

Multiply the number of yarn being spun by the new hank roving and this product by the number of teeth in the change draught gear being used; divide this product by the number of yarn desired, multiplied by the hank roving being used. The quotient is the change draught gear required.

Example.—What change draught gear will be required to change from 24s yarn spun from 3 hank roving using a 32 teeth change draught gear to 20s yarn from 2.75 hank roving?

$24 \times 2.75 \times 32 = 2112$; $20 \times 3 = 60$; therefore, $2112 \div 60 = 35$ teeth change draught gear required.

To find the twist per inch in machine:

The product of the front roll gear, the stud gear, and the ratio of the spindle to the cylinder, divided by the product of the cylinder gear, and the circumference in inches of the front roll, equals the twist constant. Constant divided by change gear equals twist per inch.

Example.—108 teeth front roll gear, 88 teeth stud gear, 8.33 ratio of $\frac{3}{4}$ " whirl to 7" cylinder, 22 teeth cylinder gear, $1" \times \frac{2.2}{7} =$ circ. front roll; twist constant required?

$$\frac{108 \times 88 \times 7 \times 8.33}{22 \times 1" \times 22} = 1144.99 = \text{Twist Constant.}$$

To find what change twist gear will be required when changing from one number of yarn to another:

Square the number of teeth in the change twist gear being used, and multiply by the number of yarn being spun. Divide the product by the number of yarn desired; the square root of the quotient will be the number of teeth in the change gear required.

Example.—What change twist gear will be required to change from 24s warp yarn, now using a 25 teeth change twist gear to 20s warp yarn?

$25^2 = 625$; $625 \times 24 = 15000$; $15000 \div 20 = 750$; $\sqrt{750} = 27$ teeth, change twist gear required.

To find the hanks per spindle per day:

Divide the product of the circumference of the front roll, the number of revolutions per minute of the front roll, the number of minutes per hour and the hours per day by the product of the number of inches in one yard and the number of yards in one hank. The resulting quotient is the number of hanks per day per spindle without an allowance being made for stoppages, due to doffing, cleaning and oiling. The usual allowances for the different numbers of yarn may be noted by reference to Production Tables on Ring Spinning.

Example.—How many hanks of number 20s warp yarn per spindle per 10 hours will be produced by a frame with 1 inch front roll running 100 revolutions per minute?

$$\text{Answer} - \frac{1 \times 3.1416 \times 100 \times 60 \times 10 \times .90}{36 \times 840} = 5.61 \text{ hanks.}$$

To find the pounds per spindle per day:

Divide the number of hanks produced per spindle per day by the number of yarn.

Example.—Taking the above problem,
 $5.61 \text{ hanks} \div 20 = .28 \text{ pounds of 20s warp per day per spindle.}$

Sizes of Spinning Ring Flanges

| | | | |
|------------------|------------------------------------|-------|------------------------------------|
| No. 1 | flange is $\frac{4}{32}$ inch wide | No. 5 | flange is $\frac{8}{32}$ inch wide |
| " 2 | " " $\frac{5}{32}$ " " | " 6 | " " $\frac{9}{32}$ " " |
| " $2\frac{1}{2}$ | " " $\frac{11}{64}$ " " | " 7 | " " $\frac{10}{32}$ " " |
| " 3 | " " $\frac{6}{32}$ " " | " 8 | " " $\frac{11}{32}$ " " |
| " 4 | " " $\frac{7}{32}$ " " | " 9 | " " $\frac{12}{32}$ " " |

No. 10 flange is $\frac{13}{32}$ inch wide

Weight of yarn on bobbins:

| | | | | | |
|------------------|----------------|----|-----------|-------|---------------|
| $2\frac{1}{2}$ " | diameter ring, | 7" | traverse, | 3.876 | oz. of cotton |
| $2\frac{1}{4}$ " | " | " | 7" | 3.325 | " " |
| 2 " | " | " | 6" | 2.8 | " " |
| $1\frac{3}{4}$ " | " | " | 6" | 2.00 | " " |
| $1\frac{5}{8}$ " | " | " | 5" | 1.30 | " " |
| $1\frac{1}{2}$ " | " | " | 5" | 1.25 | " " |

TABLE FOR NUMBERING COTTON YARN

By the Weight in Grains of 120 Yards or One Skein

| 120 yds. weigh grains. | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn |
|------------------------------|----------------------|-----------------------------|----------------------|-----------------------------|----------------------|-----------------------------|----------------------|-----------------------------|----------------------|
| 1. | 1000. | 13. | 76.92 | 19. | 52.63 | 25. | 40.00 | 31. | 32.26 |
| 2. | 500. | 1 | 76.34 | 1 | 52.36 | 1 | 39.84 | 1 | 32.16 |
| 3. | 333.3 | 2 | 75.76 | 2 | 52.08 | 2 | 39.68 | 2 | 32.05 |
| 4. | 250.0 | 3 | 75.19 | 3 | 51.81 | 3 | 39.53 | 3 | 31.95 |
| 5. | 200.0 | 4 | 74.63 | 4 | 51.55 | 4 | 39.37 | 4 | 31.85 |
| 5.5 | 181.8 | 5 | 74.07 | 5 | 51.28 | 5 | 39.22 | 5 | 31.75 |
| 6. | 166.7 | 6 | 73.53 | 6 | 51.02 | 6 | 39.06 | 6 | 31.65 |
| 6.5 | 153.8 | 7 | 72.99 | 7 | 50.76 | 7 | 38.91 | 7 | 31.55 |
| 7. | 142.9 | 8 | 72.46 | 8 | 50.51 | 8 | 38.76 | 8 | 31.45 |
| 7.5 | 133.3 | 9 | 71.94 | 9 | 50.25 | 9 | 38.61 | 9 | 31.35 |
| 8. | 125.0 | 14. | 71.43 | 20. | 50.00 | 26. | 38.46 | 32. | 31.25 |
| 1. | 123.5 | 1 | 70.92 | 1 | 49.75 | 1 | 38.31 | 1 | 31.15 |
| 2. | 122.0 | 2 | 70.42 | 2 | 49.50 | 2 | 38.17 | 2 | 31.06 |
| 3. | 120.5 | 3 | 69.93 | 3 | 49.26 | 3 | 38.02 | 3 | 30.96 |
| 4. | 119.0 | 4 | 69.44 | 4 | 49.02 | 4 | 37.88 | 4 | 30.86 |
| 5. | 117.6 | 5 | 68.97 | 5 | 48.78 | 5 | 37.74 | 5 | 30.77 |
| 6. | 116.3 | 6 | 68.49 | 6 | 48.54 | 6 | 37.59 | 6 | 30.67 |
| 7. | 114.9 | 7 | 68.03 | 7 | 48.31 | 7 | 37.45 | 7 | 30.58 |
| 8. | 113.6 | 8 | 67.57 | 8 | 48.08 | 8 | 37.31 | 8 | 30.49 |
| 9. | 112.4 | 9 | 67.11 | 9 | 47.85 | 9 | 37.17 | 9 | 30.40 |
| 9. | 111.1 | 15. | 66.67 | 21. | 47.62 | 27. | 37.04 | 33. | 30.30 |
| 1. | 109.9 | 1 | 66.23 | 1 | 47.39 | 1 | 36.90 | 1 | 30.21 |
| 2. | 108.7 | 2 | 65.79 | 2 | 47.17 | 2 | 36.77 | 2 | 30.12 |
| 3. | 107.5 | 3 | 65.36 | 3 | 46.95 | 3 | 36.63 | 3 | 30.03 |
| 4. | 106.4 | 4 | 64.94 | 4 | 46.73 | 4 | 36.50 | 4 | 29.94 |
| 5. | 105.3 | 5 | 64.52 | 5 | 46.51 | 5 | 36.36 | 5 | 29.85 |
| 6. | 104.2 | 6 | 64.10 | 6 | 46.30 | 6 | 36.23 | 6 | 29.76 |
| 7. | 103.1 | 7 | 63.69 | 7 | 46.08 | 7 | 36.10 | 7 | 29.67 |
| 8. | 102.0 | 8 | 63.29 | 8 | 45.87 | 8 | 35.97 | 8 | 29.59 |
| 9. | 101.0 | 9 | 62.89 | 9 | 45.66 | 9 | 35.84 | 9 | 29.50 |
| 10. | 100.0 | 16. | 62.50 | 22. | 45.45 | 28. | 35.71 | 34. | 29.41 |
| 1. | 99.01 | 1 | 62.11 | 1 | 45.25 | 1 | 35.59 | 1 | 29.33 |
| 2. | 98.04 | 2 | 61.73 | 2 | 45.05 | 2 | 35.46 | 2 | 29.24 |
| 3. | 97.09 | 3 | 61.35 | 3 | 44.84 | 3 | 35.34 | 3 | 29.15 |
| 4. | 96.15 | 4 | 60.98 | 4 | 44.64 | 4 | 35.21 | 4 | 29.07 |
| 5. | 95.24 | 5 | 60.61 | 5 | 44.44 | 5 | 35.09 | 5 | 28.99 |
| 6. | 94.34 | 6 | 60.24 | 6 | 44.25 | 6 | 34.97 | 6 | 28.90 |
| 7. | 93.46 | 7 | 59.88 | 7 | 44.05 | 7 | 34.84 | 7 | 28.82 |
| 8. | 92.59 | 8 | 59.52 | 8 | 43.86 | 8 | 34.72 | 8 | 28.74 |
| 9. | 91.74 | 9 | 59.17 | 9 | 43.67 | 9 | 34.60 | 9 | 28.65 |
| 11. | 90.91 | 17. | 58.82 | 23. | 43.48 | 29. | 34.48 | 35. | 28.57 |
| 1. | 90.09 | 1 | 58.48 | 1 | 43.29 | 1 | 34.36 | 1 | 28.49 |
| 2. | 89.29 | 2 | 58.14 | 2 | 43.10 | 2 | 34.25 | 2 | 28.41 |
| 3. | 88.50 | 3 | 57.80 | 3 | 42.92 | 3 | 34.13 | 3 | 28.33 |
| 4. | 87.72 | 4 | 57.47 | 4 | 42.74 | 4 | 34.01 | 4 | 28.25 |
| 5. | 86.96 | 5 | 57.14 | 5 | 42.55 | 5 | 33.90 | 5 | 28.17 |
| 6. | 86.21 | 6 | 56.82 | 6 | 42.37 | 6 | 33.78 | 6 | 28.09 |
| 7. | 85.47 | 7 | 56.50 | 7 | 42.19 | 7 | 33.67 | 7 | 28.01 |
| 8. | 84.75 | 8 | 56.18 | 8 | 42.02 | 8 | 33.56 | 8 | 27.93 |
| 9. | 84.03 | 9 | 55.87 | 9 | 41.84 | 9 | 33.44 | 9 | 27.86 |
| 12. | 83.33 | 18. | 55.56 | 24. | 41.67 | 30. | 33.33 | 36. | 27.78 |
| 1. | 82.64 | 1 | 55.25 | 1 | 41.49 | 1 | 33.22 | 1 | 27.70 |
| 2. | 81.97 | 2 | 54.95 | 2 | 41.32 | 2 | 33.11 | 2 | 27.62 |
| 3. | 81.30 | 3 | 54.64 | 3 | 41.15 | 3 | 33.00 | 3 | 27.55 |
| 4. | 80.65 | 4 | 54.35 | 4 | 40.98 | 4 | 32.89 | 4 | 27.47 |
| 5. | 80.00 | 5 | 54.05 | 5 | 40.82 | 5 | 32.79 | 5 | 27.40 |
| 6. | 79.37 | 6 | 53.76 | 6 | 40.65 | 6 | 32.68 | 6 | 27.32 |
| 7. | 78.74 | 7 | 53.48 | 7 | 40.49 | 7 | 32.57 | 7 | 27.25 |
| 8. | 78.12 | 8 | 53.19 | 8 | 40.32 | 8 | 32.47 | 8 | 27.17 |
| 9. | 77.52 | 9 | 52.91 | 9 | 40.16 | 9 | 32.36 | 9 | 27.10 |

TABLE FOR NUMBERING COTTON YARN

By the Weight in Grains of 120 Yards or One Skein

| 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn |
|-----------------------------|----------------------|-----------------------------|----------------------|-----------------------------|----------------------|-----------------------------|----------------------|-----------------------------|----------------------|
| 37. | 27.03 | 43. | 23.26 | 49. | 20.41 | 55. | 18.18 | 61. | 16.39 |
| .1 | 26.95 | .1 | 23.20 | .1 | 20.37 | .1 | 18.15 | .1 | 16.37 |
| .2 | 26.88 | .2 | 23.15 | .2 | 20.33 | .2 | 18.12 | .2 | 16.34 |
| .3 | 26.81 | .3 | 23.09 | .3 | 20.28 | .3 | 18.08 | .3 | 16.31 |
| .4 | 26.74 | .4 | 23.04 | .4 | 20.24 | .4 | 18.05 | .4 | 16.29 |
| .5 | 26.67 | .5 | 22.99 | .5 | 20.20 | .5 | 18.02 | .5 | 16.26 |
| .6 | 26.60 | .6 | 22.94 | .6 | 20.16 | .6 | 17.99 | .6 | 16.23 |
| .7 | 26.53 | .7 | 22.88 | .7 | 20.12 | .7 | 17.95 | .7 | 16.21 |
| .8 | 26.46 | .8 | 22.83 | .8 | 20.08 | .8 | 17.92 | .8 | 16.19 |
| .9 | 26.39 | .9 | 22.78 | .9 | 20.04 | .9 | 17.89 | .9 | 16.16 |
| 38. | 26.32 | 44. | 22.73 | 50. | 20.00 | 56. | 17.86 | 62. | 16.13 |
| .1 | 26.25 | .1 | 22.68 | .1 | 19.96 | .1 | 17.83 | .1 | 16.10 |
| .2 | 26.18 | .2 | 22.62 | .2 | 19.92 | .2 | 17.79 | .2 | 16.08 |
| .3 | 26.11 | .3 | 22.57 | .3 | 19.88 | .3 | 17.76 | .3 | 16.05 |
| .4 | 26.04 | .4 | 22.52 | .4 | 19.84 | .4 | 17.73 | .4 | 16.03 |
| .5 | 25.97 | .5 | 22.47 | .5 | 19.80 | .5 | 17.70 | .5 | 16.00 |
| .6 | 25.91 | .6 | 22.42 | .6 | 19.76 | .6 | 17.67 | .6 | 15.97 |
| .7 | 25.84 | .7 | 22.37 | .7 | 19.72 | .7 | 17.64 | .7 | 15.95 |
| .8 | 25.77 | .8 | 22.32 | .8 | 19.69 | .8 | 17.61 | .8 | 15.92 |
| .9 | 25.71 | .9 | 22.27 | .9 | 19.65 | .9 | 17.57 | .9 | 15.90 |
| 39. | 25.64 | 45. | 22.22 | 51. | 19.61 | 57. | 17.54 | 63. | 15.87 |
| .1 | 25.58 | .1 | 22.17 | .1 | 19.57 | .1 | 17.51 | .1 | 15.85 |
| .2 | 25.51 | .2 | 22.12 | .2 | 19.53 | .2 | 17.48 | .2 | 15.83 |
| .3 | 25.45 | .3 | 22.08 | .3 | 19.49 | .3 | 17.45 | .3 | 15.80 |
| .4 | 25.38 | .4 | 22.03 | .4 | 19.46 | .4 | 17.42 | .4 | 15.77 |
| .5 | 25.32 | .5 | 21.98 | .5 | 19.42 | .5 | 17.39 | .5 | 15.75 |
| .6 | 25.25 | .6 | 21.93 | .6 | 19.38 | .6 | 17.36 | .6 | 15.72 |
| .7 | 25.19 | .7 | 21.88 | .7 | 19.34 | .7 | 17.33 | .7 | 15.70 |
| .8 | 25.13 | .8 | 21.83 | .8 | 19.31 | .8 | 17.30 | .8 | 15.67 |
| .9 | 25.06 | .9 | 21.79 | .9 | 19.27 | .9 | 17.27 | .9 | 15.65 |
| 40. | 25.00 | 46. | 21.74 | 52. | 19.23 | 58. | 17.24 | 64. | 15.62 |
| .1 | 24.94 | .1 | 21.69 | .1 | 19.19 | .1 | 17.21 | .1 | 15.60 |
| .2 | 24.88 | .2 | 21.65 | .2 | 19.16 | .2 | 17.18 | .2 | 15.58 |
| .3 | 24.81 | .3 | 21.60 | .3 | 19.12 | .3 | 17.15 | .3 | 15.55 |
| .4 | 24.75 | .4 | 21.55 | .4 | 19.08 | .4 | 17.12 | .4 | 15.53 |
| .5 | 24.69 | .5 | 21.51 | .5 | 19.05 | .5 | 17.09 | .5 | 15.50 |
| .6 | 24.63 | .6 | 21.46 | .6 | 19.01 | .6 | 17.06 | .6 | 15.48 |
| .7 | 24.57 | .7 | 21.41 | .7 | 18.98 | .7 | 17.04 | .7 | 15.46 |
| .8 | 24.51 | .8 | 21.37 | .8 | 18.94 | .8 | 17.01 | .8 | 15.43 |
| .9 | 24.45 | .9 | 21.32 | .9 | 18.90 | .9 | 16.98 | .9 | 15.41 |
| 41. | 24.39 | 47. | 21.28 | 53. | 18.87 | 59. | 16.95 | 65. | 15.38 |
| .1 | 24.33 | .1 | 21.23 | .1 | 18.83 | .1 | 16.92 | .1 | 15.36 |
| .2 | 24.27 | .2 | 21.19 | .2 | 18.80 | .2 | 16.89 | .2 | 15.34 |
| .3 | 24.21 | .3 | 21.14 | .3 | 18.76 | .3 | 16.86 | .3 | 15.31 |
| .4 | 24.15 | .4 | 21.10 | .4 | 18.73 | .4 | 16.84 | .4 | 15.29 |
| .5 | 24.10 | .5 | 21.05 | .5 | 18.69 | .5 | 16.81 | .5 | 15.27 |
| .6 | 24.04 | .6 | 21.01 | .6 | 18.66 | .6 | 16.78 | .6 | 15.24 |
| .7 | 23.98 | .7 | 20.96 | .7 | 18.62 | .7 | 16.75 | .7 | 15.22 |
| .8 | 23.92 | .8 | 20.92 | .8 | 18.59 | .8 | 16.72 | .8 | 15.20 |
| .9 | 23.87 | .9 | 20.88 | .9 | 18.55 | .9 | 16.69 | .9 | 15.17 |
| 42. | 23.81 | 48. | 20.83 | 54. | 18.52 | 60. | 16.67 | 66. | 15.15 |
| .1 | 23.75 | .1 | 20.79 | .1 | 18.48 | .1 | 16.64 | .1 | 15.13 |
| .2 | 23.70 | .2 | 20.75 | .2 | 18.45 | .2 | 16.61 | .2 | 15.11 |
| .3 | 23.64 | .3 | 20.70 | .3 | 18.42 | .3 | 16.58 | .3 | 15.08 |
| .4 | 23.58 | .4 | 20.66 | .4 | 18.38 | .4 | 16.56 | .4 | 15.06 |
| .5 | 23.53 | .5 | 20.62 | .5 | 18.35 | .5 | 16.53 | .5 | 15.04 |
| .6 | 23.47 | .6 | 20.57 | .6 | 18.32 | .6 | 16.50 | .6 | 15.02 |
| .7 | 23.42 | .7 | 20.53 | .7 | 18.28 | .7 | 16.47 | .7 | 14.99 |
| .8 | 23.36 | .8 | 20.49 | .8 | 18.25 | .8 | 16.45 | .8 | 14.97 |
| .9 | 23.31 | .9 | 20.45 | .9 | 18.21 | .9 | 16.42 | .9 | 14.95 |

TABLE FOR NUMBERING COTTON YARN

By the Weight in Grains of 120 Yards, or One Skein

| 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn |
|-----------------------------|----------------------|-----------------------------|----------------------|-----------------------------|----------------------|-----------------------------|----------------------|-----------------------------|----------------------|
| 67. | 14.93 | 73. | 13.70 | 79. | 12.66 | 85. | 11.76 | 91. | 10.99 |
| .1 | 14.90 | .1 | 13.68 | .1 | 12.64 | .1 | 11.75 | .1 | 10.98 |
| .2 | 14.88 | .2 | 13.66 | .2 | 12.63 | .2 | 11.74 | .2 | 10.96 |
| .3 | 14.86 | .3 | 13.64 | .3 | 12.61 | .3 | 11.72 | .3 | 10.95 |
| .4 | 14.84 | .4 | 13.62 | .4 | 12.59 | .4 | 11.71 | .4 | 10.94 |
| .5 | 14.81 | .5 | 13.61 | .5 | 12.58 | .5 | 11.70 | .5 | 10.93 |
| .6 | 14.79 | .6 | 13.59 | .6 | 12.56 | .6 | 11.68 | .6 | 10.92 |
| .7 | 14.77 | .7 | 13.57 | .7 | 12.55 | .7 | 11.67 | .7 | 10.91 |
| .8 | 14.75 | .8 | 13.55 | .8 | 12.53 | .8 | 11.66 | .8 | 10.89 |
| .9 | 14.73 | .9 | 13.53 | .9 | 12.52 | .9 | 11.64 | .9 | 10.88 |
| 68. | 14.71 | 74. | 13.51 | 80. | 12.50 | 86. | 11.63 | 92. | 10.87 |
| .1 | 14.68 | .1 | 13.50 | .1 | 12.48 | .1 | 11.61 | .1 | 10.86 |
| .2 | 14.66 | .2 | 13.48 | .2 | 12.47 | .2 | 11.60 | .2 | 10.85 |
| .3 | 14.64 | .3 | 13.46 | .3 | 12.45 | .3 | 11.59 | .3 | 10.83 |
| .4 | 14.62 | .4 | 13.44 | .4 | 12.44 | .4 | 11.57 | .4 | 10.82 |
| .5 | 14.60 | .5 | 13.42 | .5 | 12.42 | .5 | 11.56 | .5 | 10.81 |
| .6 | 14.58 | .6 | 13.40 | .6 | 12.41 | .6 | 11.55 | .6 | 10.80 |
| .7 | 14.56 | .7 | 13.39 | .7 | 12.39 | .7 | 11.53 | .7 | 10.79 |
| .8 | 14.53 | .8 | 13.37 | .8 | 12.38 | .8 | 11.52 | .8 | 10.78 |
| .9 | 14.51 | .9 | 13.35 | .9 | 12.36 | .9 | 11.51 | .9 | 10.76 |
| 69. | 14.49 | 75. | 13.33 | 81. | 12.35 | 87. | 11.49 | 93. | 10.75 |
| .1 | 14.47 | .1 | 13.32 | .1 | 12.33 | .1 | 11.48 | .1 | 10.74 |
| .2 | 14.45 | .2 | 13.30 | .2 | 12.32 | .2 | 11.47 | .2 | 10.73 |
| .3 | 14.43 | .3 | 13.28 | .3 | 12.30 | .3 | 11.45 | .3 | 10.72 |
| .4 | 14.41 | .4 | 13.26 | .4 | 12.29 | .4 | 11.44 | .4 | 10.71 |
| .5 | 14.39 | .5 | 13.25 | .5 | 12.27 | .5 | 11.43 | .5 | 10.70 |
| .6 | 14.37 | .6 | 13.23 | .6 | 12.25 | .6 | 11.42 | .6 | 10.68 |
| .7 | 14.35 | .7 | 13.21 | .7 | 12.24 | .7 | 11.40 | .7 | 10.67 |
| .8 | 14.33 | .8 | 13.19 | .8 | 12.22 | .8 | 11.39 | .8 | 10.66 |
| .9 | 14.31 | .9 | 13.18 | .9 | 12.21 | .9 | 11.38 | .9 | 10.65 |
| 70. | 14.29 | 76. | 13.16 | 82. | 12.20 | 88. | 11.36 | 94. | 10.64 |
| .1 | 14.27 | .1 | 13.14 | .1 | 12.18 | .1 | 11.35 | .1 | 10.63 |
| .2 | 14.25 | .2 | 13.12 | .2 | 12.17 | .2 | 11.34 | .2 | 10.62 |
| .3 | 14.22 | .3 | 13.11 | .3 | 12.15 | .3 | 11.33 | .3 | 10.60 |
| .4 | 14.20 | .4 | 13.09 | .4 | 12.14 | .4 | 11.31 | .4 | 10.59 |
| .5 | 14.18 | .5 | 13.07 | .5 | 12.12 | .5 | 11.30 | .5 | 10.58 |
| .6 | 14.16 | .6 | 13.05 | .6 | 12.11 | .6 | 11.29 | .6 | 10.57 |
| .7 | 14.14 | .7 | 13.04 | .7 | 12.09 | .7 | 11.27 | .7 | 10.56 |
| .8 | 14.12 | .8 | 13.02 | .8 | 12.08 | .8 | 11.26 | .8 | 10.55 |
| .9 | 14.10 | .9 | 13.00 | .9 | 12.06 | .9 | 11.25 | .9 | 10.54 |
| 71. | 14.08 | 77. | 12.99 | 83. | 12.05 | 89. | 11.24 | 95. | 10.53 |
| .1 | 14.06 | .1 | 12.97 | .1 | 12.03 | .1 | 11.22 | .1 | 10.52 |
| .2 | 14.04 | .2 | 12.95 | .2 | 12.02 | .2 | 11.21 | .2 | 10.50 |
| .3 | 14.03 | .3 | 12.94 | .3 | 12.00 | .3 | 11.20 | .3 | 10.49 |
| .4 | 14.01 | .4 | 12.92 | .4 | 11.99 | .4 | 11.19 | .4 | 10.48 |
| .5 | 13.99 | .5 | 12.90 | .5 | 11.98 | .5 | 11.17 | .5 | 10.47 |
| .6 | 13.97 | .6 | 12.89 | .6 | 11.96 | .6 | 11.16 | .6 | 10.46 |
| .7 | 13.95 | .7 | 12.87 | .7 | 11.95 | .7 | 11.15 | .7 | 10.45 |
| .8 | 13.93 | .8 | 12.85 | .8 | 11.93 | .8 | 11.14 | .8 | 10.44 |
| .9 | 13.91 | .9 | 12.84 | .9 | 11.92 | .9 | 11.12 | .9 | 10.43 |
| 72. | 13.89 | 78. | 12.82 | 84. | 11.90 | 90. | 11.11 | 96. | 10.42 |
| .1 | 13.87 | .1 | 12.80 | .1 | 11.89 | .1 | 11.10 | .1 | 10.41 |
| .2 | 13.85 | .2 | 12.79 | .2 | 11.88 | .2 | 11.09 | .2 | 10.40 |
| .3 | 13.83 | .3 | 12.77 | .3 | 11.86 | .3 | 11.07 | .3 | 10.38 |
| .4 | 13.81 | .4 | 12.76 | .4 | 11.85 | .4 | 11.06 | .4 | 10.37 |
| .5 | 13.79 | .5 | 12.74 | .5 | 11.83 | .5 | 11.05 | .5 | 10.36 |
| .6 | 13.77 | .6 | 12.72 | .6 | 11.82 | .6 | 11.04 | .6 | 10.35 |
| .7 | 13.76 | .7 | 12.71 | .7 | 11.81 | .7 | 11.03 | .7 | 10.34 |
| .8 | 13.74 | .8 | 12.69 | .8 | 11.79 | .8 | 11.01 | .8 | 10.33 |
| .9 | 13.72 | .9 | 12.67 | .9 | 11.78 | .9 | 11.00 | .9 | 10.32 |

TABLE FOR NUMBERING COTTON YARN

By the Weight in Grains of 120 Yards or One Skein

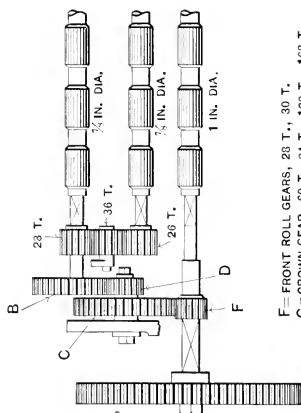
| 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn |
|-----------------------------|----------------------|-----------------------------|----------------------|-----------------------------|----------------------|-----------------------------|----------------------|-----------------------------|----------------------|
| 97. | 10.31 | 103. | 9.71 | 109. | 9.17 | 121. | 8.26 | 150. | 6.67 |
| .1 | 10.30 | .1 | 9.70 | .2 | 9.16 | .4 | 8.24 | .5 | 6.64 |
| .2 | 10.29 | .2 | 9.69 | .4 | 9.14 | .6 | 8.22 | 151. | 6.62 |
| .3 | 10.28 | .3 | 9.68 | .6 | 9.12 | .8 | 8.21 | .5 | 6.60 |
| .6 | 10.27 | .4 | 9.67 | .8 | 9.11 | 122. | 8.20 | 152. | 6.58 |
| .5 | 10.26 | .5 | 9.66 | 110. | 9.09 | .5 | 8.16 | .5 | 6.56 |
| .6 | 10.25 | .6 | 9.65 | .2 | 9.07 | 123. | 8.13 | 153. | 6.54 |
| .7 | 10.24 | .7 | 9.64 | .4 | 9.06 | .5 | 8.10 | .5 | 6.51 |
| .8 | 10.22 | .8 | 9.63 | .6 | 9.04 | 124. | 8.06 | 154. | 6.49 |
| .9 | 10.21 | .9 | 9.62 | .8 | 9.03 | .5 | 8.03 | .5 | 6.47 |
| 98. | 10.20 | 104. | 9.62 | 111. | 9.01 | 125. | 8.00 | 155. | 6.45 |
| .1 | 10.19 | .1 | 9.61 | .2 | 8.99 | .5 | 7.97 | .5 | 6.43 |
| .2 | 10.18 | .2 | 9.60 | .4 | 8.98 | 126. | 7.94 | 156. | 6.41 |
| .3 | 10.17 | .3 | 9.59 | .6 | 8.96 | .5 | 7.91 | .5 | 6.39 |
| .4 | 10.16 | .4 | 9.58 | .8 | 8.94 | 127. | 7.87 | 157. | 6.37 |
| .5 | 10.15 | .5 | 9.57 | 112. | 8.93 | .5 | 7.84 | .5 | 6.35 |
| .6 | 10.14 | .6 | 9.56 | .2 | 8.91 | 128. | 7.81 | 158. | 6.33 |
| .7 | 10.13 | .7 | 9.55 | .4 | 8.90 | .5 | 7.78 | .5 | 6.31 |
| .8 | 10.12 | .8 | 9.54 | .6 | 8.88 | 129. | 7.75 | 159. | 6.29 |
| .9 | 10.11 | .9 | 9.53 | .8 | 8.87 | .5 | 7.72 | .5 | 6.27 |
| 99. | 10.10 | 105. | 9.52 | 113. | 8.85 | 130. | 7.69 | 160. | 6.25 |
| .1 | 10.09 | .1 | 9.51 | .2 | 8.83 | .5 | 7.66 | .5 | 6.23 |
| .2 | 10.08 | .2 | 9.51 | .4 | 8.82 | 131. | 7.63 | 161. | 6.21 |
| .3 | 10.07 | .3 | 9.50 | .6 | 8.80 | .5 | 7.60 | .5 | 6.19 |
| .4 | 10.06 | .4 | 9.49 | .8 | 8.79 | 132. | 7.58 | 162. | 6.17 |
| .5 | 10.05 | .5 | 9.48 | 114. | 8.77 | .5 | 7.55 | .5 | 6.15 |
| .6 | 10.04 | .6 | 9.47 | .2 | 8.76 | 133. | 7.52 | 163. | 6.13 |
| .7 | 10.03 | .7 | 9.46 | .4 | 8.74 | .5 | 7.49 | .5 | 6.12 |
| .8 | 10.02 | .8 | 9.45 | .6 | 8.73 | 134. | 7.46 | 164. | 6.10 |
| .9 | 10.01 | .9 | 9.44 | .8 | 8.71 | .5 | 7.43 | .5 | 6.08 |
| 100. | 10.00 | 106. | 9.43 | 115. | 8.70 | 135. | 7.41 | 165. | 6.06 |
| .1 | 9.99 | .1 | 9.43 | .2 | 8.68 | .5 | 7.38 | .5 | 6.04 |
| .2 | 9.98 | .2 | 9.42 | .4 | 8.67 | 136. | 7.35 | 166. | 6.02 |
| .3 | 9.97 | .3 | 9.41 | .6 | 8.65 | .5 | 7.33 | .5 | 6.01 |
| .4 | 9.96 | .4 | 9.40 | .8 | 8.64 | 137. | 7.30 | 167. | 5.99 |
| .5 | 9.95 | .5 | 9.39 | 116. | 8.62 | .5 | 7.27 | .5 | 5.97 |
| .6 | 9.94 | .6 | 9.38 | .2 | 8.61 | 138. | 7.25 | 168. | 5.95 |
| .7 | 9.93 | .7 | 9.37 | .4 | 8.59 | .5 | 7.22 | .5 | 5.93 |
| .8 | 9.92 | .8 | 9.36 | .6 | 8.58 | 139. | 7.19 | 169. | 5.92 |
| .9 | 9.91 | .9 | 9.35 | .8 | 8.56 | .5 | 7.17 | .5 | 5.90 |
| 101. | 9.90 | 107. | 9.35 | 117. | 8.55 | 140. | 7.14 | 170. | 5.88 |
| .1 | 9.89 | .1 | 9.34 | .2 | 8.53 | .5 | 7.12 | 171. | 5.85 |
| .2 | 9.88 | .2 | 9.33 | .4 | 8.52 | 141. | 7.09 | 172. | 5.81 |
| .3 | 9.87 | .3 | 9.32 | .6 | 8.50 | .5 | 7.07 | 173. | 5.78 |
| .4 | 9.86 | .4 | 9.31 | .8 | 8.49 | 142. | 7.04 | 174. | 5.75 |
| .5 | 9.85 | .5 | 9.30 | 118. | 8.47 | .5 | 7.02 | 175. | 5.71 |
| .6 | 9.84 | .6 | 9.29 | .2 | 8.46 | 143. | 6.99 | 176. | 5.68 |
| .7 | 9.83 | .7 | 9.29 | .4 | 8.45 | .5 | 6.97 | 177. | 5.65 |
| .8 | 9.82 | .8 | 9.28 | .6 | 8.43 | 144. | 6.94 | 178. | 5.62 |
| .9 | 9.81 | .9 | 9.27 | .8 | 8.42 | .5 | 6.92 | 179. | 5.59 |
| 102. | 9.80 | 108. | 9.26 | 119. | 8.40 | 145. | 6.90 | 180. | 5.56 |
| .1 | 9.79 | .1 | 9.25 | .2 | 8.39 | .5 | 6.87 | 181. | 5.52 |
| .2 | 9.78 | .2 | 9.24 | .4 | 8.38 | 146. | 6.85 | 182. | 5.49 |
| .3 | 9.77 | .3 | 9.23 | .6 | 8.36 | .5 | 6.83 | 183. | 5.46 |
| .4 | 9.77 | .4 | 9.23 | .8 | 8.35 | 147. | 6.80 | 184. | 5.43 |
| .5 | 9.76 | .5 | 9.22 | 120. | 8.33 | .5 | 6.78 | 185. | 5.41 |
| .6 | 9.75 | .6 | 9.21 | .2 | 8.32 | 148. | 6.76 | 186. | 5.38 |
| .7 | 9.74 | .7 | 9.20 | .4 | 8.31 | .5 | 6.73 | 187. | 5.35 |
| .8 | 9.73 | .8 | 9.19 | .6 | 8.29 | 149. | 6.71 | 188. | 5.32 |
| .9 | 9.72 | .9 | 9.18 | .8 | 8.28 | .5 | 6.69 | 189. | 5.29 |

TABLE FOR NUMBERING COTTON YARN

By the Weight in Grains of 120 Yards, or One Skein

| 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn | 120 yds. weigh grains | Numb'r of Yarn |
|-----------------------------|----------------------|-----------------------------|----------------------|-----------------------------|----------------------|-----------------------------|----------------------|-----------------------------|----------------------|
| 190. | 5.26 | 230. | 4.35 | 290. | 3.45 | 370. | 2.70 | 550. | 1.82 |
| 191. | 5.24 | 231. | 4.33 | 292. | 3.42 | 372. | 2.69 | 555. | 1.80 |
| 192. | 5.21 | 232. | 4.31 | 294. | 3.40 | 374. | 2.67 | 560. | 1.79 |
| 193. | 5.18 | 233. | 4.29 | 296. | 3.38 | 376. | 2.66 | 565. | 1.77 |
| 194. | 5.15 | 234. | 4.27 | 298. | 3.36 | 378. | 2.65 | 570. | 1.75 |
| 195. | 5.13 | 235. | 4.26 | 300. | 3.33 | 380. | 2.63 | 575. | 1.74 |
| 196. | 5.10 | 236. | 4.24 | 302. | 3.31 | 382. | 2.62 | 580. | 1.72 |
| 197. | 5.08 | 237. | 4.22 | 304. | 3.29 | 385. | 2.60 | 585. | 1.71 |
| 198. | 5.05 | 238. | 4.20 | 306. | 3.27 | 390. | 2.56 | 590. | 1.69 |
| 199. | 5.03 | 239. | 4.18 | 308. | 3.25 | 395. | 2.53 | 595. | 1.68 |
| 200. | 5.00 | 240. | 4.17 | 310. | 3.23 | 400. | 2.50 | 600. | 1.67 |
| 201. | 4.98 | 241. | 4.15 | 312. | 3.21 | 405. | 2.47 | 610. | 1.64 |
| 202. | 4.95 | 242. | 4.13 | 314. | 3.18 | 410. | 2.44 | 620. | 1.61 |
| 203. | 4.93 | 243. | 4.12 | 316. | 3.17 | 415. | 2.41 | 630. | 1.59 |
| 204. | 4.90 | 244. | 4.10 | 318. | 3.14 | 420. | 2.38 | 640. | 1.56 |
| 205. | 4.88 | 245. | 4.08 | 320. | 3.12 | 425. | 2.35 | 650. | 1.54 |
| 206. | 4.85 | 246. | 4.07 | 322. | 3.11 | 430. | 2.33 | 660. | 1.52 |
| 207. | 4.83 | 247. | 4.05 | 324. | 3.09 | 435. | 2.30 | 670. | 1.49 |
| 208. | 4.81 | 248. | 4.03 | 326. | 3.07 | 440. | 2.27 | 680. | 1.47 |
| 209. | 4.78 | 249. | 4.02 | 328. | 3.05 | 445. | 2.25 | 690. | 1.45 |
| 210. | 4.76 | 250. | 4.00 | 330. | 3.03 | 450. | 2.22 | 700. | 1.43 |
| 211. | 4.74 | 252. | 3.97 | 332. | 3.01 | 455. | 2.20 | 710. | 1.41 |
| 212. | 4.72 | 254. | 3.94 | 334. | 2.99 | 460. | 2.17 | 720. | 1.39 |
| 213. | 4.69 | 256. | 3.91 | 336. | 2.98 | 465. | 2.15 | 730. | 1.37 |
| 214. | 4.67 | 258. | 3.88 | 338. | 2.96 | 470. | 2.13 | 740. | 1.35 |
| 215. | 4.65 | 260. | 3.85 | 340. | 2.94 | 475. | 2.11 | 750. | 1.33 |
| 216. | 4.63 | 262. | 3.82 | 342. | 2.92 | 480. | 2.08 | 760. | 1.32 |
| 217. | 4.61 | 264. | 3.79 | 344. | 2.91 | 485. | 2.06 | 770. | 1.30 |
| 218. | 4.59 | 266. | 3.76 | 346. | 2.89 | 490. | 2.04 | 780. | 1.28 |
| 219. | 4.57 | 268. | 3.73 | 348. | 2.87 | 495. | 2.02 | 790. | 1.27 |
| 220. | 4.55 | 270. | 3.70 | 350. | 2.86 | 500. | 2.00 | 800. | 1.25 |
| 221. | 4.52 | 272. | 3.68 | 352. | 2.84 | 505. | 1.98 | 820. | 1.22 |
| 222. | 4.50 | 274. | 3.65 | 354. | 2.82 | 510. | 1.96 | 840. | 1.19 |
| 223. | 4.48 | 276. | 3.62 | 356. | 2.81 | 515. | 1.94 | 860. | 1.16 |
| 224. | 4.46 | 278. | 3.60 | 358. | 2.79 | 520. | 1.92 | 880. | 1.14 |
| 225. | 4.44 | 280. | 3.57 | 360. | 2.78 | 525. | 1.90 | 900. | 1.11 |
| 226. | 4.42 | 282. | 3.55 | 362. | 2.76 | 530. | 1.89 | 925. | 1.08 |
| 227. | 4.41 | 284. | 3.52 | 364. | 2.75 | 535. | 1.87 | 950. | 1.05 |
| 228. | 4.39 | 286. | 3.50 | 366. | 2.73 | 540. | 1.85 | 975. | 1.03 |
| 229. | 4.37 | 288. | 3.47 | 368. | 2.72 | 545. | 1.83 | 1000. | 1.00 |

GEARING DIAGRAMS AND FORMULA FOR FIGURING DRAUGHT.



F = FRONT ROLL GEARS, 28 T., 30 T.
 C = CROWN GEAR, 60 T., 84 T., 120 T., 168 T.
 D = DRAUGHT GEAR, 26-80 T.
 B = BACK ROLL GEAR 84 T.

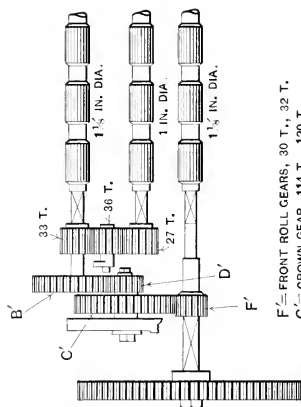
1" = DIA. OF FRONT ROLL
 .875" = DIA. OF BACK ROLL

$\frac{C \times B \times 1}{F \times D \times .875}$ OR $\frac{C \times B \times 8}{F \times D \times 7}$ = DRAUGHT

$\frac{C \times B \times 1}{F \times .875}$ OR $\frac{C \times B \times 8}{F \times 7}$ = DRAUGHT CONSTANT

$\frac{\text{DRAUGHT CONSTANT}}{\text{DRAUGHT}}$ = DRAUGHT GEAR

$\frac{\text{DRAUGHT CONSTANT}}{\text{DRAUGHT GEAR}}$ = DRAUGHT



F' = FRONT ROLL GEARS, 30 T., 32 T.
 C' = CROWN GEAR, 114 T., 120 T.
 D' = DRAUGHT GEAR, 26 T.-80 T.
 B' = BACK ROLL GEAR 80 T., 84 T.

1.125" = DIA. OF FRONT ROLL
 1.125" = DIA. OF BACK ROLL

$\frac{C' \times B' \times 1.125}{F' \times D' \times 1.125}$ = DRAUGHT

$\frac{C' \times B' \times 1.125}{F' \times 1.125}$ = DRAUGHT CONSTANT

$\frac{\text{DRAUGHT CONSTANT}}{\text{DRAUGHT}}$ = DRAUGHT GEAR

$\frac{\text{DRAUGHT CONSTANT}}{\text{DRAUGHT GEAR}}$ = DRAUGHT

Draught Gearing Constants.

| Diameter of { Front Roll 1 in. Back Roll $\frac{1}{2}$ in. | | Diameter of { Front Roll $1\frac{1}{4}$ in. Back Roll $1\frac{1}{2}$ in. | |
|---|----------|---|----------|
| Front Roll Gear, 28 T. | Constant | Front Roll Gear, 30 T. | Constant |
| Back Roll Gear, 84 T. | | Back Roll Gear, 84 T. | |
| Crown Gear, 84 T. | 288.00 | Crown Gear, 120 T. | 336.00 |
| Front Roll Gear, 30 T. | | Front Roll Gear, 32 T. | |
| Back Roll Gear, 84 T. | | Back Roll Gear, 80 T. | |
| Crown Gear, 84 T. | 268.80 | Crown Gear, 114 T. | 285.00 |
| Front Roll Gear, 30 T. | | | |
| Back Roll Gear, 84 T. | | | |
| Crown Gear, 168 T. | 537.60 | | |
| Front Roll Gear, 30 T. | | | |
| Back Roll Gear, 84 T. | | | |
| Crown Gear, 60 T. | 192.00 | | |
| Front Roll Gear, 30 T. | | | |
| Back Roll Gear, 84 T. | | | |
| Crown Gear, 120 T. | 384.00 | | |

Rule:—To find Change Gear:—Divide Constant by Draught required.

Spinning Draught Gear Table.

| Front Roll 1 in. Dia. | | Back Roll $\frac{3}{4}$ in. Dia. | | | | F. R. $1\frac{1}{8}$ in. Dia. B. R. $1\frac{1}{8}$ in. Dia. | |
|-----------------------|------------------------|---|------------------|-------------------------|-------------------------|--|------------------------|
| Change Gears | F.R.G 28T B.R.G 84T | Front Roll Gear 30T. Back Roll Gear 84T. | | | | F.R.G 30T B.R.G 84T | F.R.G 32T B.R.G 80T |
| | 84TCrown Gear | 60TCrown Gear | 84TCrown Gear | 120 T. Crown Gear | 168 T. Crown Gear | 120T Crown Gear | 114 T Crown Gear |
| | Draught. | Draught. | Draught. | Draught. | Draught. | Draught. | Draught. |
| 26T | 11.07 | 7.38 | 10.33 | 14.77 | | 12.92 | 10.96 |
| 27 | | 7.11 | | 14.22 | | 12.44 | 10.55 |
| 28 | 10.28 | 6.85 | 9.60 | 13.71 | | 12.00 | 10.17 |
| 29 | | 6.62 | | 13.24 | | 11.58 | 9.82 |
| 30 | 9.60 | 6.40 | 8.96 | 12.80 | 17.92 | 11.20 | 9.50 |
| 31 | | 6.19 | | 12.38 | | 10.83 | 9.19 |
| 32 | 9.00 | 6.00 | 8.40 | 12.00 | 16.80 | 10.50 | 8.90 |
| 33 | | 5.81 | | 11.63 | | 10.18 | 8.63 |
| 34 | 8.47 | 5.64 | 7.90 | 11.29 | 15.81 | 9.88 | 8.38 |
| 35 | | 5.48 | | 10.97 | | 9.60 | 8.14 |
| 36 | 8.00 | 5.33 | 7.46 | 10.66 | 14.93 | 9.33 | 7.91 |
| 37 | | 5.18 | | 10.37 | | 9.08 | 7.70 |
| 38 | 7.57 | 5.05 | 7.07 | 10.10 | 14.14 | 8.84 | 7.50 |
| 39 | | 4.92 | | 9.84 | | 8.61 | 7.30 |
| 40 | 7.20 | 4.80 | 6.72 | 9.60 | | 8.40 | 7.12 |
| 41 | | 4.68 | | 9.36 | 13.11 | 8.19 | 6.95 |
| 42 | 6.85 | 4.57 | 6.40 | 9.14 | | 8.00 | 6.78 |
| 43 | | | | 8.93 | | 7.81 | 6.62 |
| 44 | 6.54 | | 6.10 | | 12.21 | | |
| 45 | | | | 8.53 | | 7.46 | 6.33 |
| 46 | 6.26 | | 5.84 | | | | |
| 47 | | | | | 11.43 | | |
| 48 | 6.00 | | 5.60 | 8.00 | | 7.00 | 5.93 |
| 50 | 5.76 | | 5.37 | 7.68 | 10.75 | 6.72 | 5.70 |
| 52 | 5.53 | | 5.16 | 7.38 | | 6.46 | 5.48 |
| 53 | | | | | 10.14 | | |
| 54 | 5.33 | | 4.97 | 7.11 | | 6.22 | 5.27 |
| 56 | 5.14 | | 4.80 | 6.85 | 9.60 | 6.00 | 5.08 |
| 58 | 4.96 | | 4.63 | 6.62 | | 5.79 | 4.91 |
| 59 | | | | | 9.11 | | |
| 60 | | | | 6.40 | | 5.60 | 4.75 |
| 62 | | | | | 8.67 | | |
| 67 | | | | | 8.02 | | |
| 72 | | | | | 7.46 | | |
| 77 | | | | | 6.98 | | |
| 82 | | | | | 6.55 | | |
| Const's | 288.00 | 192.00 | 268.80 | 384.00 | 537.60 | 336.00 | 285.00 |

STANDARD Twist Tables.

| Counts or Numbers. | Square Root. | Frame Warp Twist. | Extra Mule Warp Twist. | Frame Filling Twist. | Mule Filling Twist. | Twist for Doubling. | Hosiery Yarn. |
|--------------------------|-----------------|-------------------------|---------------------------------|----------------------------|---------------------------|---------------------------|------------------|
| 1 | 1.0000 | 4.75 | 4.00 | 3.50 | 3.25 | 2.75 | 2.50 |
| 2 | 1.4142 | 6.72 | 5.66 | 4.95 | 4.60 | 3.89 | 3.53 |
| 3 | 1.7320 | 8.23 | 6.93 | 6.06 | 5.63 | 4.76 | 4.33 |
| 4 | 2.0000 | 9.50 | 8.00 | 7.00 | 6.50 | 5.50 | 5.00 |
| 5 | 2.2360 | 10.62 | 8.94 | 7.83 | 7.27 | 6.15 | 5.59 |
| 6 | 2.4494 | 11.63 | 9.80 | 8.57 | 7.96 | 6.73 | 6.12 |
| 7 | 2.6457 | 12.56 | 10.58 | 9.26 | 8.60 | 7.27 | 6.61 |
| 8 | 2.8284 | 13.43 | 11.31 | 9.90 | 9.19 | 7.78 | 7.07 |
| 9 | 3.0000 | 14.25 | 12.00 | 10.50 | 9.75 | 8.25 | 7.50 |
| 10 | 3.1622 | 15.02 | 12.65 | 11.07 | 10.27 | 8.69 | 7.90 |
| 11 | 3.3166 | 15.75 | 13.26 | 11.61 | 10.78 | 9.12 | 8.29 |
| 12 | 3.4641 | 16.45 | 13.86 | 12.12 | 11.26 | 9.52 | 8.66 |
| 13 | 3.6055 | 17.12 | 14.42 | 12.62 | 11.72 | 9.91 | 9.01 |
| 14 | 3.7416 | 17.77 | 14.96 | 13.10 | 12.16 | 10.29 | 9.35 |
| 15 | 3.8729 | 18.39 | 15.49 | 13.56 | 12.59 | 10.65 | 9.68 |
| 16 | 4.0000 | 19.00 | 16.00 | 14.00 | 13.00 | 11.00 | 10.00 |
| 17 | 4.1231 | 19.58 | 16.49 | 14.43 | 13.40 | 11.34 | 10.31 |
| 18 | 4.2426 | 20.15 | 16.97 | 14.85 | 13.79 | 11.66 | 10.60 |
| 19 | 4.3588 | 20.70 | 17.43 | 15.26 | 14.17 | 11.98 | 10.89 |
| 20 | 4.4721 | 21.24 | 17.89 | 15.65 | 14.53 | 12.30 | 11.18 |
| 21 | 4.5825 | 21.76 | 18.33 | 16.04 | 14.89 | 12.60 | 11.46 |
| 22 | 4.6904 | 22.27 | 18.76 | 16.42 | 15.24 | 12.89 | 11.73 |
| 23 | 4.7958 | 22.78 | 19.80 | 16.79 | 15.59 | 13.19 | 11.99 |
| 24 | 4.8989 | 23.27 | 19.59 | 17.15 | 15.92 | 13.47 | 12.25 |
| 25 | 5.0000 | 23.75 | 20.00 | 17.50 | 16.25 | 13.75 | 12.50 |
| 26 | 5.0990 | 24.22 | 20.39 | 17.85 | 16.57 | 14.02 | 12.75 |
| 27 | 5.1961 | 24.68 | 20.78 | 18.19 | 16.89 | 14.29 | 12.99 |
| 28 | 5.2915 | 25.13 | 21.16 | 18.52 | 17.20 | 14.55 | 13.23 |
| 29 | 5.3851 | 25.58 | 21.54 | 18.85 | 17.50 | 14.81 | 13.46 |
| 30 | 5.4772 | 26.02 | 21.91 | 19.17 | 17.80 | 15.06 | 13.69 |
| 31 | 5.5677 | 26.44 | 22.27 | 19.49 | 18.10 | 15.31 | 13.92 |
| 32 | 5.6568 | 26.87 | 22.63 | 19.80 | 18.38 | 15.55 | 14.14 |
| 33 | 5.7445 | 27.28 | 22.98 | 20.11 | 18.67 | 15.80 | 14.36 |
| 34 | 5.8309 | 27.69 | 23.32 | 20.41 | 18.95 | 16.03 | 14.58 |
| 35 | 5.9160 | 28.10 | 23.66 | 20.71 | 19.23 | 16.27 | 14.79 |
| 36 | 6.0000 | 28.50 | 24.00 | 21.00 | 19.50 | 16.50 | 15.00 |
| 37 | 6.0827 | 28.89 | 24.33 | 21.29 | 19.77 | 16.72 | 15.21 |
| 38 | 6.1644 | 29.28 | 24.66 | 21.58 | 20.03 | 16.95 | 15.41 |
| 39 | 6.2449 | 29.66 | 24.98 | 21.86 | 20.30 | 17.17 | 15.61 |
| 40 | 6.3245 | 30.04 | 25.30 | 22.14 | 20.55 | 17.39 | 15.81 |
| 41 | 6.4031 | 30.42 | 25.61 | 22.41 | 20.81 | 17.61 | 16.01 |
| 42 | 6.4807 | 30.78 | 25.92 | 22.68 | 21.06 | 17.82 | 16.20 |
| 43 | 6.5574 | 31.14 | 26.23 | 22.95 | 21.31 | 18.03 | 16.39 |
| 44 | 6.6332 | 31.50 | 26.53 | 23.22 | 21.56 | 18.24 | 16.58 |
| 45 | 6.7082 | 31.86 | 26.83 | 23.48 | 21.80 | 18.45 | 16.77 |
| 46 | 6.7823 | 32.21 | 27.13 | 23.74 | 22.04 | 18.65 | 16.96 |
| 47 | 6.8556 | 32.56 | 27.42 | 23.99 | 22.28 | 18.85 | 17.14 |
| 48 | 6.9282 | 32.90 | 27.71 | 24.25 | 22.52 | 19.05 | 17.32 |
| 49 | 7.0000 | 33.25 | 28.00 | 24.50 | 22.75 | 19.25 | 17.50 |
| 50 | 7.0710 | 33.58 | 28.28 | 24.75 | 22.98 | 19.44 | 17.68 |

STANDARD

Twist Tables. Continued.

| Counts or Numbers. | Square Root. | Frame Warp Twist. | Extra Mule Warp Twist. | Frame Filling Twist. | Mule Filling Twist. | Twist for Doubling. | Hosiery Yarn. |
|--------------------------|-----------------|-------------------------|---------------------------------|----------------------------|---------------------------|---------------------------|------------------|
| 51 | 7.1414 | 33.92 | 28.56 | 24.99 | 23.21 | 19.64 | 17.85 |
| 52 | 7.2111 | 34.25 | 28.84 | 25.24 | 23.44 | 19.83 | 18.03 |
| 53 | 7.2801 | 34.58 | 29.12 | 25.48 | 23.66 | 20.02 | 18.20 |
| 54 | 7.3484 | 34.90 | 29.39 | 25.72 | 23.88 | 20.21 | 18.37 |
| 55 | 7.4161 | 35.22 | 29.66 | 25.96 | 24.10 | 20.39 | 18.54 |
| 56 | 7.4833 | 35.54 | 29.93 | 26.19 | 24.32 | 20.58 | 18.71 |
| 57 | 7.5498 | 35.86 | 30.20 | 26.42 | 24.53 | 20.76 | 18.87 |
| 58 | 7.6157 | 36.17 | 30.46 | 26.66 | 24.75 | 20.94 | 19.04 |
| 59 | 7.6811 | 36.48 | 30.72 | 26.88 | 24.96 | 21.12 | 19.20 |
| 60 | 7.7459 | 36.79 | 30.98 | 27.11 | 25.16 | 21.30 | 19.36 |
| 61 | 7.8102 | 37.10 | 31.24 | 27.34 | 25.38 | 21.48 | |
| 62 | 7.8740 | 37.40 | 31.49 | 27.56 | 25.59 | 21.65 | |
| 63 | 7.9372 | 37.70 | 31.74 | 27.78 | 25.79 | 21.83 | |
| 64 | 8.0000 | 38.00 | 32.00 | 28.00 | 26.00 | 22.00 | |
| 65 | 8.0622 | 38.29 | 32.25 | 28.22 | 26.20 | 22.17 | |
| 66 | 8.1240 | 38.59 | 32.49 | 28.43 | 26.40 | 22.34 | |
| 67 | 8.1853 | 38.88 | 32.74 | 28.65 | 26.60 | 22.51 | |
| 68 | 8.2462 | 39.16 | 32.98 | 28.86 | 26.80 | 22.68 | |
| 69 | 8.3066 | 39.46 | 33.22 | 29.07 | 26.99 | 22.84 | |
| 70 | 8.3666 | 39.74 | 33.46 | 29.28 | 27.19 | 23.01 | |
| 71 | 8.4261 | 40.02 | 33.70 | 29.49 | 27.38 | 23.17 | |
| 72 | 8.4852 | 40.30 | 33.94 | 29.70 | 27.58 | 23.33 | |
| 73 | 8.5440 | 40.58 | 34.17 | 29.90 | 27.77 | 23.50 | |
| 74 | 8.6023 | 40.86 | 34.41 | 30.11 | 27.96 | 23.65 | |
| 75 | 8.6602 | 41.14 | 34.64 | 30.31 | 28.14 | 23.81 | |
| 76 | 8.7177 | 41.41 | 34.87 | 30.51 | 28.33 | 23.97 | |
| 77 | 8.7749 | 41.68 | 35.09 | 30.71 | 28.51 | 24.13 | |
| 78 | 8.8317 | 41.95 | 35.32 | 30.91 | 28.70 | 24.28 | |
| 79 | 8.8881 | 42.22 | 35.55 | 31.11 | 28.89 | 24.44 | |
| 80 | 8.9442 | 42.48 | 35.77 | 31.30 | 29.07 | 24.60 | |
| 81 | 9.0000 | 42.75 | 36.00 | 31.50 | 29.25 | 24.75 | |
| 82 | 9.0553 | 43.01 | 36.22 | 31.69 | 29.43 | 24.90 | |
| 83 | 9.1104 | 43.27 | 36.44 | 31.89 | 29.61 | 25.05 | |
| 84 | 9.1651 | 43.53 | 36.66 | 32.08 | 29.79 | 25.20 | |
| 85 | 9.2195 | 43.79 | 36.88 | 32.27 | 29.96 | 25.35 | |
| 86 | 9.2736 | 44.05 | 37.09 | 32.46 | 30.14 | 25.50 | |
| 87 | 9.3273 | 44.30 | 37.31 | 32.65 | 30.31 | 25.65 | |
| 88 | 9.3808 | 44.56 | 37.52 | 32.83 | 30.48 | 25.79 | |
| 89 | 9.4339 | 44.81 | 37.73 | 33.02 | 30.66 | 25.94 | |
| 90 | 9.4868 | 45.06 | 37.95 | 33.20 | 30.83 | 26.09 | |
| 91 | 9.5393 | 45.31 | 38.16 | 33.39 | 31.00 | 26.23 | |
| 92 | 9.5916 | 45.56 | 38.36 | 33.57 | 31.17 | 26.37 | |
| 93 | 9.6436 | 45.80 | 38.57 | 33.75 | 31.34 | 26.52 | |
| 94 | 9.6953 | 46.05 | 38.78 | 33.93 | 31.51 | 26.66 | |
| 95 | 9.7467 | 46.30 | 38.98 | 34.11 | 31.67 | 26.80 | |
| 96 | 9.7979 | 46.54 | 39.19 | 34.29 | 31.84 | 26.94 | |
| 97 | 9.8488 | 46.78 | 39.39 | 34.47 | 32.01 | 27.08 | |
| 98 | 9.8994 | 47.02 | 39.60 | 34.65 | 32.17 | 27.22 | |
| 99 | 9.9498 | 47.26 | 39.80 | 34.82 | 32.33 | 27.36 | |
| 100 | 10.0000 | 47.50 | 40.00 | 35.00 | 32.50 | 27.50 | |

STANDARD

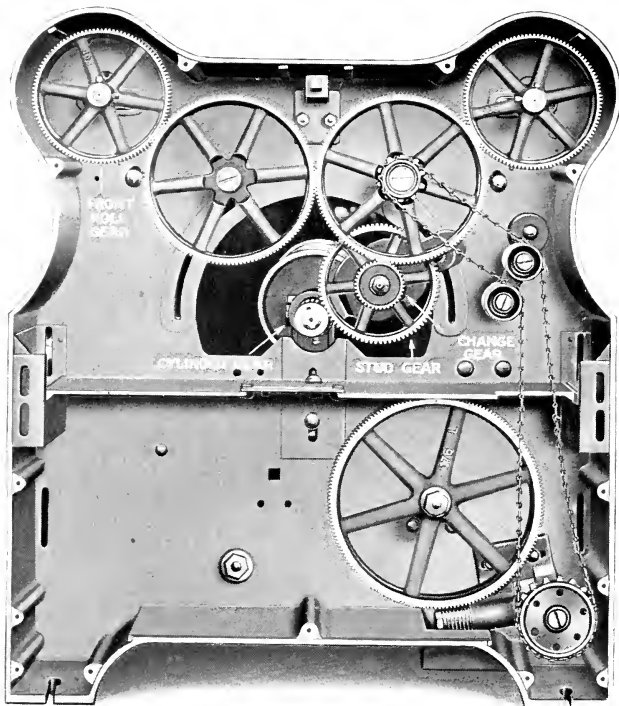
Twist Tables. Continued.

| Counts or Numbers. | Square Root. | Frame Warp Twist. | Extra Mule Warp Twist. | Frame Filling Twist. | Mule Filling Twist. | Twist for Doubling. | Hosiery Yarn. |
|--------------------------|-----------------|-------------------------|---------------------------------|----------------------------|---------------------------|---------------------------|------------------|
| 101 | 10.0499 | 47.74 | 40.20 | 35.17 | 32.66 | 27.64 | |
| 102 | 10.0995 | 47.97 | 40.40 | 35.35 | 32.82 | 27.77 | |
| 103 | 10.1489 | 48.21 | 40.60 | 35.52 | 32.98 | 27.91 | |
| 104 | 10.1980 | 48.44 | 40.79 | 35.69 | 33.14 | 28.04 | |
| 105 | 10.2470 | 48.67 | 40.99 | 35.86 | 33.30 | 28.18 | |
| 106 | 10.2956 | 48.90 | 41.18 | 36.03 | 33.46 | 28.31 | |
| 107 | 10.3441 | 49.13 | 41.38 | 36.20 | 33.62 | 28.44 | |
| 108 | 10.3923 | 49.36 | 41.57 | 36.37 | 33.78 | 28.58 | |
| 109 | 10.4403 | 49.59 | 41.76 | 36.54 | 33.93 | 28.71 | |
| 110 | 10.4881 | 49.82 | 41.95 | 36.71 | 34.09 | 28.84 | |
| 111 | 10.5357 | 50.04 | 42.14 | 36.87 | 34.24 | 28.97 | |
| 112 | 10.5830 | 50.27 | 42.33 | 37.04 | 34.39 | 29.10 | |
| 113 | 10.6301 | 50.49 | 42.52 | 37.21 | 34.55 | 29.23 | |
| 114 | 10.6771 | 50.72 | 42.71 | 37.37 | 34.70 | 29.36 | |
| 115 | 10.7238 | 50.94 | 42.90 | 37.53 | 34.85 | 29.49 | |
| 116 | 10.7703 | 51.16 | 43.08 | 37.70 | 35.00 | 29.62 | |
| 117 | 10.8167 | 51.38 | 43.27 | 37.86 | 35.15 | 29.75 | |
| 118 | 10.8628 | 51.60 | 43.45 | 38.02 | 35.30 | 29.87 | |
| 119 | 10.9087 | 51.82 | 43.63 | 38.18 | 35.45 | 30.00 | |
| 120 | 10.9545 | 52.03 | 43.82 | 38.34 | 35.60 | 30.12 | |
| 121 | 11.0000 | 52.25 | 44.00 | 38.50 | 35.75 | 30.25 | |
| 122 | 11.0454 | 52.47 | 44.18 | 38.66 | 35.90 | 30.27 | |
| 123 | 11.0905 | 52.68 | 44.36 | 38.82 | 36.04 | 30.50 | |
| 124 | 11.1355 | 52.89 | 44.54 | 38.97 | 36.19 | 30.62 | |
| 125 | 11.1803 | 53.11 | 44.72 | 39.13 | 36.34 | 30.75 | |
| 126 | 11.2250 | 53.32 | 44.90 | 39.29 | 36.48 | 30.87 | |
| 127 | 11.2694 | 53.53 | 45.08 | 39.44 | 36.63 | 30.99 | |
| 128 | 11.3137 | 53.74 | 45.25 | 39.60 | 36.77 | 31.11 | |
| 129 | 11.3578 | 53.95 | 45.43 | 39.75 | 36.91 | 31.23 | |
| 130 | 11.4018 | 54.16 | 45.61 | 39.91 | 37.06 | 31.35 | |
| 131 | 11.4455 | 54.37 | 45.78 | 40.06 | 37.20 | 31.48 | |
| 132 | 11.4891 | 54.57 | 45.96 | 40.21 | 37.34 | 31.60 | |
| 133 | 11.5326 | 54.78 | 46.13 | 40.36 | 37.48 | 31.71 | |
| 134 | 11.5758 | 54.99 | 46.30 | 40.52 | 37.62 | 31.83 | |
| 135 | 11.6190 | 55.19 | 46.48 | 40.67 | 37.76 | 31.95 | |
| 136 | 11.6619 | 55.39 | 46.65 | 40.82 | 37.90 | 32.07 | |
| 137 | 11.7047 | 55.60 | 46.82 | 40.97 | 38.04 | 32.19 | |
| 138 | 11.7473 | 55.80 | 46.99 | 41.12 | 38.18 | 32.31 | |
| 139 | 11.7898 | 56.00 | 47.16 | 41.26 | 38.32 | 32.42 | |
| 140 | 11.8322 | 56.20 | 47.33 | 41.41 | 38.45 | 32.54 | |
| 141 | 11.8743 | 56.40 | 47.50 | 41.56 | 38.59 | 32.65 | |
| 142 | 11.9164 | 56.60 | 47.67 | 41.71 | 38.73 | 32.77 | |
| 143 | 11.9583 | 56.80 | 47.83 | 41.85 | 38.86 | 32.89 | |
| 144 | 12.0000 | 57.00 | 48.00 | 42.00 | 39.00 | 33.00 | |
| 145 | 12.0416 | 57.20 | 48.17 | 42.15 | 39.14 | 33.11 | |
| 146 | 12.0830 | 57.39 | 48.33 | 42.29 | 39.27 | 33.23 | |
| 147 | 12.1244 | 57.59 | 48.50 | 42.44 | 39.40 | 33.34 | |
| 148 | 12.1655 | 57.79 | 48.66 | 42.58 | 39.54 | 33.46 | |
| 149 | 12.2066 | 57.98 | 48.83 | 42.72 | 39.67 | 33.57 | |
| 150 | 12.2474 | 58.18 | 48.99 | 42.87 | 39.80 | 33.68 | |

STANDARD

Twist Tables. Continued.

| Counts or Numbers. | Square Root. | Frame Warp Twist. | Extra Mule Warp Twist. | Frame Filling Twist. | Mule Filling Twist. | Twist for Doubling. | Hosiery Yarn. |
|--------------------------|-----------------|-------------------------|---------------------------------|----------------------------|---------------------------|---------------------------|------------------|
| 151 | 12.2882 | 58.37 | 49.15 | 43.01 | 39.94 | 33.79 | |
| 152 | 12.3288 | 58.56 | 49.32 | 43.15 | 40.07 | 33.90 | |
| 153 | 12.3693 | 58.75 | 49.48 | 43.29 | 40.20 | 34.02 | |
| 154 | 12.4097 | 58.95 | 49.64 | 43.43 | 40.33 | 34.13 | |
| 155 | 12.4499 | 59.14 | 49.80 | 43.57 | 40.46 | 34.24 | |
| 156 | 12.4900 | 59.33 | 49.96 | 43.72 | 40.59 | 34.35 | |
| 157 | 12.5300 | 59.52 | 50.12 | 43.86 | 40.72 | 34.46 | |
| 158 | 12.5698 | 59.71 | 50.28 | 43.99 | 40.85 | 34.57 | |
| 159 | 12.6095 | 59.90 | 50.44 | 44.13 | 40.98 | 34.68 | |
| 160 | 12.6491 | 60.08 | 50.60 | 44.27 | 41.11 | 34.79 | |
| 161 | 12.6886 | 60.27 | 50.75 | 44.41 | 41.24 | 34.89 | |
| 162 | 12.7279 | 60.46 | 50.91 | 44.55 | 41.37 | 35.00 | |
| 163 | 12.7671 | 60.64 | 51.07 | 44.68 | 41.49 | 35.11 | |
| 164 | 12.8062 | 60.83 | 51.22 | 44.82 | 41.62 | 35.22 | |
| 165 | 12.8452 | 61.01 | 51.38 | 44.96 | 41.75 | 35.32 | |
| 166 | 12.8841 | 61.20 | 51.54 | 45.09 | 41.87 | 35.43 | |
| 167 | 12.9228 | 61.38 | 51.69 | 45.23 | 42.00 | 35.54 | |
| 168 | 12.9615 | 61.57 | 51.85 | 45.37 | 42.12 | 35.64 | |
| 169 | 13.0000 | 61.75 | 52.00 | 45.50 | 42.25 | 35.75 | |
| 170 | 13.0384 | 61.93 | 52.15 | 45.63 | 42.37 | 35.86 | |
| 171 | 13.0767 | 62.11 | 52.31 | 45.77 | 42.50 | 35.96 | |
| 172 | 13.1149 | 62.30 | 52.46 | 45.90 | 42.62 | 36.07 | |
| 173 | 13.1529 | 62.48 | 52.61 | 46.04 | 42.75 | 36.17 | |
| 174 | 13.1909 | 62.66 | 52.76 | 46.17 | 42.87 | 36.27 | |
| 175 | 13.2288 | 62.84 | 52.92 | 46.30 | 42.99 | 36.38 | |
| 176 | 13.2665 | 63.02 | 53.07 | 46.43 | 43.12 | 36.48 | |
| 177 | 13.3041 | 63.19 | 53.22 | 46.56 | 43.24 | 36.59 | |
| 178 | 13.3417 | 63.37 | 53.37 | 46.70 | 43.36 | 36.69 | |
| 179 | 13.3791 | 63.55 | 53.52 | 46.83 | 43.48 | 36.79 | |
| 180 | 13.4164 | 63.73 | 53.67 | 46.96 | 43.60 | 36.90 | |
| 181 | 13.4536 | 63.90 | 53.81 | 47.09 | 43.72 | 37.00 | |
| 182 | 13.4907 | 64.08 | 53.96 | 47.22 | 43.84 | 37.10 | |
| 183 | 13.5277 | 64.26 | 54.11 | 47.35 | 43.97 | 37.20 | |
| 184 | 13.5647 | 64.43 | 54.26 | 47.48 | 44.09 | 37.30 | |
| 185 | 13.6015 | 64.61 | 54.41 | 47.61 | 44.20 | 37.40 | |
| 186 | 13.6382 | 64.78 | 54.55 | 47.73 | 44.32 | 37.51 | |
| 187 | 13.6748 | 64.96 | 54.70 | 47.86 | 44.44 | 37.61 | |
| 188 | 13.7113 | 65.13 | 54.85 | 47.99 | 44.56 | 37.71 | |
| 189 | 13.7477 | 65.30 | 54.99 | 48.12 | 44.68 | 37.81 | |
| 190 | 13.7840 | 65.47 | 55.14 | 48.24 | 44.80 | 37.91 | |
| 191 | 13.8203 | 65.65 | 55.28 | 48.37 | 44.92 | 38.01 | |
| 192 | 13.8564 | 65.82 | 55.43 | 48.50 | 45.03 | 38.11 | |
| 193 | 13.8924 | 65.99 | 55.57 | 48.62 | 45.15 | 38.20 | |
| 194 | 13.9284 | 66.16 | 55.71 | 48.75 | 45.27 | 38.30 | |
| 195 | 13.9642 | 66.33 | 55.86 | 48.87 | 45.38 | 38.40 | |
| 196 | 14.0000 | 66.50 | 56.00 | 49.00 | 45.50 | 38.50 | |
| 197 | 14.0357 | 66.67 | 56.14 | 49.12 | 45.62 | 38.60 | |
| 198 | 14.0712 | 66.84 | 56.28 | 49.25 | 45.73 | 38.70 | |
| 199 | 14.1067 | 67.01 | 56.43 | 49.37 | 45.85 | 38.79 | |
| 200 | 14.1421 | 67.17 | 56.57 | 49.50 | 45.96 | 38.89 | |



Band Drive Spinning Frame Twist Gearing

Formula for figuring twist:

C = Cylinder Gear.

T = Change Gear.

R = Ratio whirl to Cylinder.

S = Stud Gear.

F = Front Roll Gear.

D = Circumference of Front Roll.

$$\frac{F \times S \times R}{C \times T \times D} = \text{Twist per inch.}$$

$$\frac{F \times S \times R}{C \times D} = \text{Twist Constant.}$$

$$\frac{\text{Twist Constant}}{\text{Change Gear}} = \text{Twist per inch.}$$

$$\frac{\text{Twist Constant}}{\text{Twist per inch}} = \text{Change Gear}$$

BAND DRIVE

Twist Gearing Constants for Whifin Spinning Frame.

7 Inch Cylinder.

| Front Roll 1 in. Dia. | | | | | | | | | | Front Roll 1 in. Dia. | | | | | | | | | | Front Roll Gear 108 T | | | | | | | | | |
|-----------------------|-------------------------|------------|---------|-----------|---------|-----------|---------|-----------|---------|-----------------------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|-----------------------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|
| Front Roll 1 in. Dia. | | | | | | | | | | Front Roll 1 in. Dia. | | | | | | | | | | Front Roll Gear 108 T | | | | | | | | | |
| Diameter of Whifl | Ratio Whifl to Cylinder | Stud 100 T | | Cyl. 20 T | | Stud 80 T | | Cyl. 40 T | | Stud 80 T | | Cyl. 20 T | | Stud 80 T | | Cyl. 40 T | | Stud 80 T | | Cyl. 20 T | | Stud 80 T | | Cyl. 40 T | | Stud 80 T | | Cyl. 20 T | |
| | | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't |
| $\frac{3}{16}$ in. | 8.33 | 1431.81 | 1288.12 | 1144.99 | 1144.99 | 572.72 | 572.72 | 588.40 | 286.24 | 286.24 | 286.24 | 286.24 | 286.24 | 286.24 | 286.24 | 286.24 | 286.24 | 286.24 | 286.24 | 286.24 | 286.24 | 286.24 | 286.24 | 286.24 | 286.24 | 286.24 | 286.24 | 286.24 | 286.24 |
| $\frac{1}{2}$ in. | 7.68 | 1320.00 | 1187.00 | 1055.65 | 1055.65 | 528.48 | 528.48 | 542.48 | 263.91 | 263.91 | 263.91 | 263.91 | 263.91 | 263.91 | 263.91 | 263.91 | 263.91 | 263.91 | 263.91 | 263.91 | 263.91 | 263.91 | 263.91 | 263.91 | 263.91 | 263.91 | 263.91 | 263.91 | 263.91 |
| $\frac{5}{16}$ in. | 7.25 | 1246.18 | 1121.11 | 996.54 | 996.54 | 498.47 | 498.47 | 512.11 | 249.13 | 249.13 | 249.13 | 249.13 | 249.13 | 249.13 | 249.13 | 249.13 | 249.13 | 249.13 | 249.13 | 249.13 | 249.13 | 249.13 | 249.13 | 249.13 | 249.13 | 249.13 | 249.13 | 249.13 | 249.13 |
| $\frac{3}{8}$ in. | 6.62 | 1137.89 | 1023.69 | 909.94 | 909.94 | 455.16 | 455.16 | 467.61 | 227.48 | 227.48 | 227.48 | 227.48 | 227.48 | 227.48 | 227.48 | 227.48 | 227.48 | 227.48 | 227.48 | 227.48 | 227.48 | 227.48 | 227.48 | 227.48 | 227.48 | 227.48 | 227.48 | 227.48 | 227.48 |
| $1 \frac{1}{16}$ in. | 6.24 | 1072.57 | 964.93 | 857.71 | 857.71 | 429.03 | 429.03 | 440.77 | 214.42 | 214.42 | 214.42 | 214.42 | 214.42 | 214.42 | 214.42 | 214.42 | 214.42 | 214.42 | 214.42 | 214.42 | 214.42 | 214.42 | 214.42 | 214.42 | 214.42 | 214.42 | 214.42 | 214.42 | 214.42 |
| $1 \frac{1}{8}$ in. | 5.86 | 1007.25 | 906.16 | 805.48 | 805.48 | 402.90 | 402.90 | 413.92 | 201.37 | 201.37 | 201.37 | 201.37 | 201.37 | 201.37 | 201.37 | 201.37 | 201.37 | 201.37 | 201.37 | 201.37 | 201.37 | 201.37 | 201.37 | 201.37 | 201.37 | 201.37 | 201.37 | 201.37 | 201.37 |
| $1 \frac{3}{8}$ in. | 5.43 | 933.34 | 829.67 | 746.37 | 746.37 | 373.33 | 373.33 | 383.55 | 186.59 | 186.59 | 186.59 | 186.59 | 186.59 | 186.59 | 186.59 | 186.59 | 186.59 | 186.59 | 186.59 | 186.59 | 186.59 | 186.59 | 186.59 | 186.59 | 186.59 | 186.59 | 186.59 | 186.59 | 186.59 |
| $1 \frac{1}{2}$ in. | 4.80 | 825.05 | 742.25 | 659.78 | 659.78 | 330.02 | 330.02 | 339.05 | 164.94 | 164.94 | 164.94 | 164.94 | 164.94 | 164.94 | 164.94 | 164.94 | 164.94 | 164.94 | 164.94 | 164.94 | 164.94 | 164.94 | 164.94 | 164.94 | 164.94 | 164.94 | 164.94 | 164.94 | 164.94 |

| Front Roll 1 1/8 in. Dia. | | | | | | | | | | Front Roll 1 1/8 in. Dia. | | | | | | | | | | Front Roll Gear 108 T. | | | | | | | | | |
|---------------------------|-------------------------|------------|---------|-----------|---------|-----------|---------|-----------|---------|---------------------------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|------------------------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|
| Front Roll 1 1/8 in. Dia. | | | | | | | | | | Front Roll 1 1/8 in. Dia. | | | | | | | | | | Front Roll Gear 108 T. | | | | | | | | | |
| Diameter of Whifl | Ratio Whifl to Cylinder | Stud 100 T | | Cyl. 20 T | | Stud 80 T | | Cyl. 40 T | | Stud 80 T | | Cyl. 20 T | | Stud 80 T | | Cyl. 40 T | | Stud 80 T | | Cyl. 20 T | | Stud 80 T | | Cyl. 40 T | | Stud 80 T | | Cyl. 20 T | |
| | | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't | Const't |
| $\frac{3}{16}$ in. | 8.33 | 1272.72 | 1144.99 | 1018.18 | 1018.18 | 569.09 | 569.09 | 583.32 | 254.54 | 254.54 | 254.54 | 254.54 | 254.54 | 254.54 | 254.54 | 254.54 | 254.54 | 254.54 | 254.54 | 254.54 | 254.54 | 254.54 | 254.54 | 254.54 | 254.54 | 254.54 | 254.54 | 254.54 | 254.54 |
| $\frac{1}{2}$ in. | 7.68 | 1173.41 | 1055.65 | 938.73 | 938.73 | 469.36 | 469.36 | 482.40 | 234.62 | 234.62 | 234.62 | 234.62 | 234.62 | 234.62 | 234.62 | 234.62 | 234.62 | 234.62 | 234.62 | 234.62 | 234.62 | 234.62 | 234.62 | 234.62 | 234.62 | 234.62 | 234.62 | 234.62 | 234.62 |
| $\frac{5}{16}$ in. | 7.25 | 1107.71 | 996.54 | 886.17 | 886.17 | 443.09 | 443.09 | 455.39 | 221.54 | 221.54 | 221.54 | 221.54 | 221.54 | 221.54 | 221.54 | 221.54 | 221.54 | 221.54 | 221.54 | 221.54 | 221.54 | 221.54 | 221.54 | 221.54 | 221.54 | 221.54 | 221.54 | 221.54 | 221.54 |
| $\frac{3}{8}$ in. | 6.62 | 1011.46 | 909.94 | 809.17 | 809.17 | 404.58 | 404.58 | 415.82 | 202.29 | 202.29 | 202.29 | 202.29 | 202.29 | 202.29 | 202.29 | 202.29 | 202.29 | 202.29 | 202.29 | 202.29 | 202.29 | 202.29 | 202.29 | 202.29 | 202.29 | 202.29 | 202.29 | 202.29 | 202.29 |
| $1 \frac{1}{16}$ in. | 6.24 | 953.89 | 857.71 | 762.71 | 762.71 | 381.36 | 381.36 | 391.95 | 190.68 | 190.68 | 190.68 | 190.68 | 190.68 | 190.68 | 190.68 | 190.68 | 190.68 | 190.68 | 190.68 | 190.68 | 190.68 | 190.68 | 190.68 | 190.68 | 190.68 | 190.68 | 190.68 | 190.68 | 190.68 |
| $1 \frac{1}{8}$ in. | 5.86 | 885.54 | 805.48 | 716.27 | 716.27 | 358.14 | 358.14 | 368.09 | 179.07 | 179.07 | 179.07 | 179.07 | 179.07 | 179.07 | 179.07 | 179.07 | 179.07 | 179.07 | 179.07 | 179.07 | 179.07 | 179.07 | 179.07 | 179.07 | 179.07 | 179.07 | 179.07 | 179.07 | 179.07 |
| $1 \frac{3}{8}$ in. | 5.43 | 829.67 | 746.37 | 663.71 | 663.71 | 331.85 | 331.85 | 341.08 | 165.93 | 165.93 | 165.93 | 165.93 | 165.93 | 165.93 | 165.93 | 165.93 | 165.93 | 165.93 | 165.93 | 165.93 | 165.93 | 165.93 | 165.93 | 165.93 | 165.93 | 165.93 | 165.93 | 165.93 | 165.93 |
| $1 \frac{1}{2}$ in. | 4.80 | 733.39 | 659.78 | 586.71 | 586.71 | 293.35 | 293.35 | 301.51 | 146.71 | 146.71 | 146.71 | 146.71 | 146.71 | 146.71 | 146.71 | 146.71 | 146.71 | 146.71 | 146.71 | 146.71 | 146.71 | 146.71 | 146.71 | 146.71 | 146.71 | 146.71 | 146.71 | 146.71 | 146.71 |

Rule to find Change Gear:- Divide Constant by Twist per inch Required

BAND DRIVE

Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter

Cylinder 7 inches Diameter. Ratio Cylinder to Whirl 1 to 8.33

Whirl $\frac{1}{4}$ inch Diameter. Front Roll Gear 108 Teeth

| Change | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|---------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Gears | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 15T | 95.45 | 85.87 | 76.33 | | 38.18 | 39.23 | 19.08 |
| 16 | 89.48 | 80.50 | 71.56 | | 35.79 | 36.77 | 17.89 |
| 17 | 84.22 | 75.77 | 67.35 | | 33.68 | 34.61 | 16.84 |
| 18 | 79.54 | 71.56 | 63.61 | | 31.81 | 32.69 | 15.90 |
| 19 | 75.35 | 67.79 | 60.26 | | 30.14 | 30.97 | 15.07 |
| 20 | 71.59 | 64.40 | 57.25 | | 28.63 | 29.42 | 14.31 |
| 21 | 68.18 | 61.33 | 54.52 | | 27.27 | 28.02 | 13.63 |
| 22 | 65.08 | 58.55 | 52.04 | | 26.03 | 26.74 | 13.01 |
| 23 | 63.12 | 56.00 | 49.78 | | 24.90 | 25.58 | 12.45 |
| 24 | 59.65 | 53.67 | 47.71 | 47.71 | 23.86 | 24.52 | 11.93 |
| 25 | 57.27 | 51.52 | 45.80 | 45.80 | 22.90 | 23.54 | 11.45 |
| 26 | 55.06 | 49.54 | 44.04 | 44.04 | 22.02 | 22.63 | 11.01 |
| 27 | 53.03 | 47.70 | 42.41 | 42.41 | 21.21 | 21.79 | 10.60 |
| 28 | 51.13 | 46.00 | 40.89 | 40.89 | 20.45 | 21.01 | 10.22 |
| 29 | 49.37 | 44.41 | 39.48 | 39.48 | 19.74 | 20.29 | 9.87 |
| 30 | 47.72 | 42.93 | 38.17 | 38.17 | 19.09 | 19.61 | 9.54 |
| 31 | 46.18 | 41.55 | 36.93 | 36.93 | 18.47 | 18.98 | 9.23 |
| 32 | 44.74 | 40.25 | 35.78 | 35.78 | 17.89 | 18.39 | 8.95 |
| 33 | 43.38 | 39.03 | 34.70 | 34.70 | 17.35 | 17.83 | 8.67 |
| 34 | 42.11 | 37.88 | 33.68 | 33.68 | 16.84 | 17.30 | 8.42 |
| 35 | 40.90 | 36.80 | 32.71 | 32.71 | 16.36 | 16.81 | 8.18 |
| 36 | 39.77 | 35.78 | 31.80 | 31.80 | 15.90 | 16.34 | 7.95 |
| 37 | 38.69 | 34.81 | 30.94 | 30.94 | 15.47 | 15.90 | 7.74 |
| 38 | 37.67 | 33.89 | 30.13 | 30.13 | 15.07 | 15.48 | 7.54 |
| 39 | 36.71 | 33.02 | 29.36 | 29.36 | 14.68 | 15.08 | 7.34 |
| 40 | 35.79 | 32.20 | 28.62 | 28.62 | 14.31 | 14.71 | 7.16 |
| 41 | 34.92 | 31.41 | 27.93 | 27.93 | 13.96 | 14.35 | 6.98 |
| 42 | 34.09 | 30.66 | 27.26 | 27.26 | 13.63 | 14.00 | 6.82 |
| 43 | 33.29 | 29.95 | 26.63 | 26.63 | 13.31 | 13.68 | 6.66 |
| 44 | 32.54 | 29.27 | 26.02 | 26.02 | 13.01 | 13.37 | 6.51 |
| 45 | 31.81 | 28.62 | 25.44 | 25.44 | 12.72 | 13.07 | 6.36 |
| 46 | 31.12 | 28.00 | 24.89 | 24.89 | 12.42 | 12.79 | 6.22 |
| 47 | 30.46 | 27.40 | 24.36 | 24.36 | 12.10 | 12.52 | 6.09 |
| 48 | 29.82 | 26.83 | 23.85 | 23.85 | 11.83 | 12.26 | 5.97 |
| 49 | 29.22 | 26.28 | 23.37 | 23.37 | 11.68 | 12.01 | 5.84 |
| 50 | 28.63 | 25.76 | 22.90 | 22.90 | 11.45 | 11.77 | 5.72 |
| 51 | 28.07 | 25.25 | 22.45 | 22.45 | 11.22 | 11.54 | 5.61 |
| 52 | 27.53 | 24.77 | 22.02 | 22.02 | 11.01 | 11.31 | 5.50 |
| 53 | 27.01 | 24.30 | 21.60 | 21.60 | 10.80 | 11.10 | 5.40 |
| 54 | 26.51 | 23.85 | 21.20 | 21.20 | 10.60 | 10.90 | 5.30 |
| 55 | 26.03 | 23.42 | 20.82 | 20.82 | 10.41 | 10.70 | 5.20 |
| 56 | 25.56 | 23.00 | 20.45 | 20.45 | 10.22 | 10.51 | 5.11 |
| 57 | 25.11 | 22.59 | 20.09 | 20.09 | 10.04 | 10.32 | 5.02 |
| 58 | 24.68 | 22.20 | 19.74 | 19.74 | 9.87 | 10.14 | 4.93 |
| Const's | 1431.81 | 1288.12 | 1144.99 | 1144.99 | 572.72 | 588.40 | 286.24 |

BAND DRIVE Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter

Cylinder 7 inches Diameter. Ratio Cylinder to Whirl 1 to 8.33
Whirl $\frac{1}{4}$ inch Diameter Front Roll Gear 108 Teeth

| Change Gears | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|-----------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 59 | 24.26 | 21.83 | 19.41 | 19.41 | 9.70 | 9.97 | 4.85 |
| 60 | 23.86 | 21.46 | 19.08 | 19.08 | 9.54 | 9.81 | 4.77 |
| 61 | 23.47 | 21.11 | 18.77 | 18.77 | 9.38 | 9.65 | 4.69 |
| 62 | 23.00 | 20.77 | 18.47 | 18.47 | 9.23 | 9.49 | 4.62 |
| 63 | 22.72 | 20.44 | 18.17 | 18.17 | 9.09 | 9.34 | 4.54 |
| 64 | 22.37 | 20.19 | 17.89 | 17.89 | 8.94 | 9.19 | 4.47 |
| 65 | 22.02 | 19.81 | 17.62 | 17.62 | 8.80 | 9.05 | 4.40 |
| 66 | 21.69 | 19.51 | 17.35 | 17.35 | 8.67 | 8.92 | 4.34 |
| 67 | 21.37 | 19.07 | 17.09 | 17.09 | 8.54 | 8.78 | 4.27 |
| 68 | 21.05 | 18.79 | 16.84 | 16.84 | 8.42 | 8.65 | 4.21 |
| 69 | 20.75 | 18.66 | 16.59 | 16.59 | 8.30 | 8.53 | 4.15 |
| 70 | 20.45 | 18.40 | 16.36 | 16.36 | 8.18 | 8.41 | 4.09 |
| 71 | 20.16 | 18.14 | 16.13 | 16.13 | 8.06 | 8.29 | 4.03 |
| 72 | 19.88 | 17.89 | 15.90 | 15.90 | 7.95 | 8.17 | 3.98 |
| 73 | 19.61 | 17.64 | 15.68 | 15.68 | 7.84 | 8.06 | 3.92 |
| 74 | 19.35 | 17.40 | 15.47 | 15.47 | 7.73 | 7.95 | 3.87 |
| 75 | 19.10 | 17.17 | 15.27 | 15.27 | 7.63 | 7.85 | 3.82 |
| 76 | 18.85 | 16.94 | 15.07 | 15.07 | 7.53 | 7.74 | 3.76 |
| 77 | 18.60 | 16.73 | 14.87 | 14.87 | 7.43 | 7.64 | 3.72 |
| 78 | 18.35 | 16.52 | 14.68 | 14.68 | 7.34 | 7.54 | 3.67 |
| 79 | 18.12 | 16.31 | 14.49 | 14.49 | 7.24 | 7.45 | 3.62 |
| 80 | 17.90 | 16.11 | 14.31 | 14.31 | 7.15 | 7.35 | 3.58 |
| 81 | 17.68 | 15.90 | 14.14 | 14.14 | 7.07 | 7.26 | 3.53 |
| 82 | 17.46 | 15.70 | 13.96 | 13.96 | 6.98 | 7.18 | 3.49 |
| 83 | 17.25 | 15.52 | 13.79 | 13.79 | 6.90 | 7.09 | 3.45 |
| 84 | 17.05 | 15.34 | 13.63 | 13.63 | 6.81 | 7.00 | 3.41 |
| 85 | 16.85 | 15.16 | 13.47 | 13.47 | 6.73 | 6.92 | 3.37 |
| 86 | 16.65 | 14.98 | 13.31 | 13.31 | 6.65 | 6.84 | 3.33 |
| 87 | 16.47 | 14.81 | 13.16 | 13.16 | 6.58 | 6.76 | 3.29 |
| 88 | 16.29 | 14.65 | 13.01 | 13.01 | 6.50 | 6.69 | 3.25 |
| 89 | 16.10 | 14.49 | 12.87 | 12.87 | 6.43 | 6.61 | 3.22 |
| 90 | 15.92 | 14.32 | 12.72 | 12.72 | 6.36 | 6.54 | 3.18 |
| 91 | 15.75 | 14.16 | 12.58 | | 6.29 | 6.47 | 3.15 |
| 92 | 15.58 | 14.00 | 12.45 | | 6.22 | 6.40 | 3.11 |
| 93 | 15.42 | 13.85 | 12.31 | | 6.15 | 6.33 | 3.08 |
| 94 | 15.26 | 13.70 | 12.18 | | 6.09 | 6.26 | 3.04 |
| | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears |
| | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame |
| | 24-94 T | 30-94 T | 30-94 T | 40-88 T | 15-94 T | 28-94 T | 30-94 T |
| | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame |
| | 15-70 T | 15-86 T | 15-86 T | 24-90 T | 15-94 T | 15-94 T | 15-94 T |
| Const's | 1431 81 | 1288.12 | 1144.99 | 1144.99 | 572.72 | 588.40 | 286.24 |

BAND DRIVE Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter.

Cylinder 7 inch Diameter. Ratio Cylinder to Whirl 1 to 7.68.

Whirl $\frac{13}{16}$ inch Diameter. Front Roll Gear 108 Teeth.

| Change Gears | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|-----------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 15T | 88.01 | 79.17 | 70.38 | | 35.20 | 36.17 | 17.59 |
| 16 | 82.50 | 74.22 | 65.98 | | 33.00 | 33.91 | 16.50 |
| 17 | 77.65 | 69.85 | 62.00 | | 31.06 | 31.91 | 15.52 |
| 18 | 73.33 | 65.97 | 58.65 | | 29.33 | 30.14 | 14.66 |
| 19 | 69.47 | 62.50 | 55.56 | | 27.79 | 28.55 | 13.89 |
| 20 | 66.00 | 59.38 | 52.78 | | 26.40 | 27.12 | 13.20 |
| 21 | 62.86 | 56.55 | 50.27 | | 25.14 | 25.83 | 12.57 |
| 22 | 60.00 | 53.98 | 47.98 | | 24.00 | 24.66 | 12.00 |
| 23 | 57.30 | 51.63 | 45.80 | | 22.96 | 23.59 | 11.50 |
| 24 | 55.00 | 49.48 | 43.98 | 43.98 | 22.00 | 22.60 | 11.00 |
| 25 | 52.80 | 47.50 | 42.23 | 42.23 | 21.12 | 21.70 | 10.56 |
| 26 | 50.77 | 45.67 | 40.60 | 40.60 | 20.30 | 20.86 | 10.15 |
| 27 | 48.89 | 43.98 | 39.10 | 39.10 | 19.55 | 20.00 | 9.77 |
| 28 | 47.14 | 42.41 | 37.70 | 37.70 | 18.85 | 19.37 | 9.43 |
| 29 | 45.52 | 40.95 | 36.40 | 36.40 | 18.20 | 18.71 | 9.10 |
| 30 | 44.00 | 39.58 | 35.19 | 35.19 | 17.60 | 18.08 | 8.80 |
| 31 | 42.58 | 38.30 | 34.05 | 34.05 | 17.03 | 17.50 | 8.52 |
| 32 | 41.25 | 37.11 | 32.99 | 32.99 | 16.50 | 16.95 | 8.25 |
| 33 | 40.00 | 35.98 | 31.99 | 31.99 | 16.00 | 16.44 | 8.00 |
| 34 | 38.82 | 34.92 | 31.04 | 31.04 | 15.53 | 15.95 | 7.76 |
| 35 | 37.71 | 33.93 | 30.16 | 30.16 | 15.08 | 15.21 | 7.54 |
| 36 | 36.66 | 32.98 | 29.32 | 29.32 | 14.66 | 15.06 | 7.33 |
| 37 | 35.67 | 32.00 | 28.53 | 28.53 | 14.27 | 14.66 | 7.13 |
| 38 | 34.73 | 31.25 | 27.78 | 27.78 | 13.89 | 14.28 | 6.95 |
| 39 | 33.84 | 30.45 | 27.06 | 27.06 | 13.53 | 13.91 | 6.77 |
| 40 | 33.00 | 29.69 | 26.39 | 26.39 | 13.20 | 13.56 | 6.60 |
| 41 | 32.19 | 28.98 | 25.74 | 25.74 | 12.87 | 13.23 | 6.44 |
| 42 | 31.43 | 28.27 | 25.13 | 25.13 | 12.57 | 12.91 | 6.28 |
| 43 | 30.69 | 27.61 | 24.55 | 24.55 | 12.28 | 12.61 | 6.14 |
| 44 | 30.00 | 26.99 | 23.99 | 23.99 | 12.00 | 12.33 | 6.00 |
| 45 | 29.33 | 26.38 | 23.46 | 23.46 | 11.73 | 12.05 | 5.87 |
| 46 | 28.69 | 25.81 | 22.95 | 22.95 | 11.47 | 11.79 | 5.74 |
| 47 | 28.08 | 25.26 | 22.46 | 22.46 | 11.23 | 11.54 | 5.62 |
| 48 | 27.50 | 24.74 | 21.99 | 21.99 | 11.00 | 11.30 | 5.50 |
| 49 | 26.94 | 24.23 | 21.54 | 21.54 | 10.77 | 11.07 | 5.39 |
| 50 | 26.40 | 23.75 | 21.11 | 21.11 | 10.56 | 10.85 | 5.28 |
| 51 | 25.88 | 23.28 | 20.70 | 20.70 | 10.35 | 10.64 | 5.17 |
| 52 | 25.38 | 22.83 | 20.30 | 20.30 | 10.15 | 10.43 | 5.08 |
| 53 | 24.90 | 22.40 | 19.92 | 19.92 | 9.96 | 10.24 | 4.98 |
| 54 | 24.44 | 21.99 | 19.55 | 19.55 | 9.77 | 10.04 | 4.89 |
| 55 | 24.00 | 21.59 | 19.19 | 19.19 | 9.60 | 9.86 | 4.80 |
| 56 | 23.57 | 21.20 | 18.85 | 18.85 | 9.42 | 9.68 | 4.72 |
| 57 | 23.15 | 20.83 | 18.52 | 18.52 | 9.26 | 9.52 | 4.63 |
| 58 | 22.76 | 20.47 | 18.20 | 18.20 | 9.10 | 9.35 | 4.55 |
| Const's | 1320.09 | 1187.60 | 1055.65 | 1055.65 | 528.04 | 542.48 | 263.91 |

BAND DRIVE Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter.

Cylinder 7 inch Diameter.

Ratio Cylinder to Whirl 1 to 7.68.

Whirl $\frac{1\frac{3}{8}}$ inch Diameter.

Front Roll Gear 108 Teeth

| Change Gears | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|-----------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 5 T | 22.37 | 20.12 | 17.89 | 17.89 | 8.94 | 9.19 | 4.47 |
| 60 | 22.00 | 19.71 | 17.59 | 17.59 | 8.80 | 9.04 | 4.40 |
| 61 | 21.64 | 19.46 | 17.31 | 17.31 | 8.66 | 8.89 | 4.33 |
| 62 | 21.29 | 19.15 | 17.03 | 17.03 | 8.51 | 8.75 | 4.26 |
| 63 | 20.95 | 18.85 | 16.76 | 16.76 | 8.38 | 8.61 | 4.19 |
| 64 | 20.62 | 18.55 | 16.49 | 16.49 | 8.25 | 8.48 | 4.12 |
| 65 | 20.30 | 18.27 | 16.24 | 16.24 | 8.12 | 8.35 | 4.06 |
| 66 | 20.00 | 17.99 | 15.99 | 15.99 | 8.00 | 8.22 | 4.00 |
| 67 | 19.70 | 17.72 | 15.76 | 15.76 | 7.88 | 8.10 | 3.94 |
| 68 | 19.41 | 17.46 | 15.52 | 15.52 | 7.76 | 7.98 | 3.88 |
| 69 | 19.13 | 17.20 | 15.30 | 15.30 | 7.65 | 7.86 | 3.82 |
| 70 | 18.85 | 16.96 | 15.08 | 15.08 | 7.54 | 7.75 | 3.77 |
| 71 | 18.59 | 16.71 | 14.87 | 14.87 | 7.43 | 7.64 | 3.72 |
| 72 | 18.33 | 16.49 | 14.66 | 14.66 | 7.33 | 7.53 | 3.67 |
| 73 | 18.09 | 16.26 | 14.46 | 14.46 | 7.23 | 7.43 | 3.62 |
| 74 | 17.84 | 16.04 | 14.27 | 14.27 | 7.13 | 7.33 | 3.57 |
| 75 | 17.60 | 15.83 | 14.08 | 14.08 | 7.04 | 7.23 | 3.52 |
| 76 | 17.38 | 15.63 | 13.89 | 13.89 | 6.94 | 7.14 | 3.47 |
| 77 | 17.16 | 15.43 | 13.71 | 13.71 | 6.85 | 7.04 | 3.43 |
| 78 | 16.93 | 15.23 | 13.53 | 13.53 | 6.76 | 6.95 | 3.38 |
| 79 | 16.71 | 15.03 | 13.36 | 13.36 | 6.68 | 6.87 | 3.34 |
| 80 | 16.51 | 14.85 | 13.20 | 13.20 | 6.60 | 6.78 | 3.30 |
| 81 | 16.30 | 14.67 | 13.03 | 13.03 | 6.51 | 6.70 | 3.26 |
| 82 | 16.10 | 14.49 | 12.87 | 12.87 | 6.43 | 6.62 | 3.22 |
| 83 | 15.90 | 14.31 | 12.72 | 12.72 | 6.36 | 6.54 | 3.18 |
| 84 | 15.72 | 14.14 | 12.57 | 12.57 | 6.28 | 6.46 | 3.14 |
| 85 | 15.53 | 13.97 | 12.42 | 12.42 | 6.21 | 6.38 | 3.10 |
| 86 | 15.35 | 13.81 | 12.28 | 12.28 | 6.14 | 6.31 | 3.07 |
| 87 | 15.17 | 13.65 | 12.13 | 12.13 | 6.06 | 6.24 | 3.03 |
| 88 | 15.00 | 13.50 | 12.00 | 12.00 | 6.00 | 6.16 | 3.00 |
| 89 | 14.83 | 13.35 | 11.86 | 11.86 | 5.93 | 6.10 | 2.97 |
| 90 | 14.67 | 13.20 | 11.73 | 11.73 | 5.86 | 6.03 | 2.93 |
| 91 | 14.51 | 13.05 | 11.60 | | 5.80 | 5.96 | 2.90 |
| 92 | 14.35 | 12.91 | 11.47 | | 5.73 | 5.90 | 2.87 |
| 93 | 14.19 | 12.77 | 11.35 | | 5.67 | 5.83 | 2.84 |
| 94 | 14.04 | 12.63 | 11.23 | | 5.61 | 5.77 | 2.81 |
| Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears |
| 36" Frame | 36" Frame | 36" Frame | 36" Frame | 36" Frame | 36" Frame | 36" Frame | 36" Frame |
| 24-94 T | 30-94 T | 30-94 T | 40-88 T | 15-94 T | 28-94 T | 30-94 T | |
| 39" Frame | 39" Frame | 39" Frame | 39" Frame | 39" Frame | 39" Frame | 39" Frame | |
| 15-70 T | 15-86 T | 15-86 T | 24-90 T | 15-94 T | 15-94 T | 15-94 T | |
| Const's | 1320.09 | 1187.00 | 1055.65 | 1055.65 | 528.04 | 542.48 | 263.91 |

BAND DRIVE

Spinning Twist Gear Table.

FRONT ROLL 1 Inch Diameter.

Cylinder 7 inches Diameter. Ratio Cylinder to Whirl 1 to 7.25
 Whirl $\frac{7}{8}$ inch Diameter. Front Roll Gear 108 Teeth

| Change | Cyl. 20T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|---------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Gears | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 15T | 83.08 | 74.74 | 66.44 | | 33.23 | 34.14 | 16.61 |
| 16 | 77.88 | 70.07 | 62.28 | | 31.15 | 32.00 | 15.57 |
| 17 | 73.30 | 65.94 | 58.62 | | 29.32 | 30.12 | 14.65 |
| 18 | 69.23 | 62.28 | 55.36 | | 27.69 | 28.45 | 13.84 |
| 19 | 65.58 | 59.00 | 52.45 | | 26.23 | 26.95 | 13.11 |
| 20 | 62.30 | 56.05 | 49.83 | | 24.92 | 25.60 | 12.46 |
| 21 | 59.34 | 53.38 | 47.45 | | 23.73 | 24.39 | 11.86 |
| 22 | 56.64 | 50.95 | 45.30 | | 22.65 | 23.28 | 11.32 |
| 23 | 54.18 | 48.74 | 43.33 | | 21.67 | 22.26 | 10.83 |
| 24 | 52.18 | 46.71 | 41.52 | 41.52 | 20.76 | 21.33 | 10.38 |
| 25 | 50.16 | 44.84 | 39.86 | 39.86 | 19.93 | 20.48 | 9.97 |
| 26 | 48.15 | 43.11 | 38.32 | 38.32 | 19.17 | 19.70 | 9.58 |
| 27 | 46.15 | 41.52 | 36.91 | 36.91 | 18.46 | 18.97 | 9.23 |
| 28 | 44.65 | 40.03 | 35.59 | 35.59 | 17.80 | 18.29 | 8.89 |
| 29 | 43.18 | 38.65 | 34.36 | 34.36 | 17.18 | 17.66 | 8.59 |
| 30 | 41.65 | 37.37 | 33.22 | 33.22 | 16.61 | 17.07 | 8.30 |
| 31 | 40.20 | 36.16 | 32.15 | 32.15 | 16.07 | 16.52 | 8.04 |
| 32 | 39.00 | 35.03 | 31.14 | 31.14 | 15.57 | 16.00 | 7.78 |
| 33 | 37.80 | 33.97 | 30.20 | 30.20 | 15.10 | 15.52 | 7.55 |
| 34 | 36.70 | 32.97 | 29.31 | 29.31 | 14.70 | 15.06 | 7.33 |
| 35 | 35.61 | 32.03 | 28.47 | 28.47 | 14.24 | 14.63 | 7.12 |
| 36 | 34.61 | 31.14 | 27.68 | 27.68 | 13.84 | 14.22 | 6.92 |
| 37 | 33.68 | 30.30 | 26.93 | 26.93 | 13.47 | 13.84 | 6.73 |
| 38 | 32.79 | 29.50 | 26.22 | 26.22 | 13.11 | 13.48 | 6.55 |
| 39 | 31.95 | 28.74 | 25.55 | 25.55 | 12.75 | 13.13 | 6.38 |
| 40 | 31.15 | 28.02 | 24.91 | 24.91 | 12.46 | 12.80 | 6.23 |
| 41 | 30.39 | 27.34 | 24.30 | 24.30 | 12.15 | 12.49 | 6.08 |
| 42 | 29.67 | 26.69 | 23.73 | 23.73 | 11.86 | 12.19 | 5.93 |
| 43 | 28.98 | 26.07 | 23.17 | 23.17 | 11.59 | 11.91 | 5.80 |
| 44 | 28.32 | 25.47 | 22.65 | 22.65 | 11.32 | 11.64 | 5.66 |
| 45 | 27.69 | 24.91 | 22.14 | 22.14 | 11.07 | 11.38 | 5.53 |
| 46 | 27.09 | 24.37 | 21.66 | 21.66 | 10.83 | 11.13 | 5.42 |
| 47 | 26.51 | 23.85 | 21.20 | 21.20 | 10.60 | 10.89 | 5.30 |
| 48 | 25.96 | 23.35 | 20.76 | 20.76 | 10.38 | 10.67 | 5.19 |
| 49 | 25.43 | 22.87 | 20.34 | 20.34 | 10.17 | 10.45 | 5.08 |
| 50 | 24.92 | 22.42 | 19.93 | 19.93 | 9.96 | 10.24 | 4.98 |
| 51 | 24.52 | 21.98 | 19.54 | 19.54 | 9.77 | 10.04 | 4.89 |
| 52 | 23.96 | 21.55 | 19.16 | 19.16 | 9.58 | 9.85 | 4.79 |
| 53 | 23.51 | 21.15 | 18.80 | 18.80 | 9.40 | 9.66 | 4.70 |
| 54 | 23.07 | 20.76 | 18.45 | 18.45 | 9.23 | 9.48 | 4.62 |
| 55 | 22.65 | 20.38 | 18.12 | 18.12 | 9.06 | 9.31 | 4.53 |
| 56 | 22.25 | 20.01 | 17.79 | 17.79 | 8.90 | 9.14 | 4.45 |
| 57 | 21.86 | 19.66 | 17.48 | 17.48 | 8.74 | 8.98 | 4.37 |
| 58 | 21.48 | 19.32 | 17.18 | 17.18 | 8.59 | 8.83 | 4.29 |
| Const's | 1246.18 | 1121.11 | 996.54 | 996.54 | 498.47 | 512.11 | 249.13 |

BAND DRIVE Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter

Cylinder 7 inches Diameter. Ratio Cylinder to Whirl 1 to 7.25
Whirl $\frac{7}{8}$ inch Diameter Front Roll Gear 108 Teeth

| Change | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Gears | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 59T | 21.12 | 19.00 | 16.89 | 16.89 | 8.44 | 8.68 | 4.22 |
| 60 | 20.76 | 18.68 | 16.61 | 16.61 | 8.30 | 8.53 | 4.15 |
| 61 | 20.42 | 18.37 | 16.34 | 16.34 | 8.17 | 8.39 | 4.08 |
| 62 | 20.09 | 18.08 | 16.07 | 16.07 | 8.03 | 8.26 | 4.02 |
| 63 | 19.78 | 17.79 | 15.82 | 15.82 | 7.91 | 8.13 | 3.95 |
| 64 | 19.49 | 17.51 | 15.57 | 15.57 | 7.78 | 8.00 | 3.89 |
| 65 | 19.17 | 17.24 | 15.33 | 15.33 | 7.66 | 7.88 | 3.83 |
| 66 | 18.88 | 16.98 | 15.10 | 15.10 | 7.55 | 7.76 | 3.77 |
| 67 | 18.59 | 16.73 | 14.87 | 14.87 | 7.43 | 7.64 | 3.72 |
| 68 | 18.32 | 16.48 | 14.65 | 14.65 | 7.33 | 7.53 | 3.66 |
| 69 | 18.06 | 16.24 | 14.44 | 14.44 | 7.22 | 7.42 | 3.61 |
| 70 | 17.80 | 16.00 | 14.24 | 14.24 | 7.12 | 7.32 | 3.56 |
| 71 | 17.55 | 15.79 | 14.04 | 14.04 | 7.02 | 7.21 | 3.51 |
| 72 | 17.30 | 15.57 | 13.84 | 13.84 | 6.92 | 7.11 | 3.46 |
| 73 | 17.07 | 15.35 | 13.65 | 13.65 | 6.82 | 7.02 | 3.41 |
| 74 | 16.84 | 15.15 | 13.47 | 13.47 | 6.73 | 6.92 | 3.37 |
| 75 | 16.62 | 14.95 | 13.29 | 13.29 | 6.64 | 6.83 | 3.32 |
| 76 | 16.40 | 14.76 | 13.11 | 13.11 | 6.55 | 6.74 | 3.28 |
| 77 | 16.19 | 14.57 | 12.94 | 12.94 | 6.47 | 6.65 | 3.24 |
| 78 | 16.98 | 14.38 | 12.78 | 12.78 | 6.39 | 6.57 | 3.19 |
| 79 | 15.77 | 14.19 | 12.61 | 12.61 | 6.30 | 6.48 | 3.15 |
| 80 | 15.58 | 14.02 | 12.46 | 12.46 | 6.23 | 6.40 | 3.11 |
| 81 | 15.39 | 13.85 | 12.30 | 12.30 | 6.15 | 6.32 | 3.08 |
| 82 | 15.20 | 13.68 | 12.15 | 12.15 | 6.07 | 6.25 | 3.04 |
| 83 | 15.01 | 13.51 | 12.01 | 12.01 | 6.00 | 6.17 | 3.00 |
| 84 | 14.83 | 13.35 | 11.86 | 11.86 | 5.93 | 6.10 | 2.97 |
| 85 | 14.66 | 13.19 | 11.72 | 11.72 | 5.88 | 6.02 | 2.93 |
| 86 | 14.49 | 14.04 | 11.59 | 11.59 | 5.79 | 5.95 | 2.90 |
| 87 | 14.32 | 12.89 | 11.45 | 11.45 | 5.72 | 5.89 | 2.86 |
| 88 | 14.16 | 12.74 | 11.32 | 11.32 | 5.66 | 5.82 | 2.83 |
| 89 | 14.00 | 12.60 | 11.20 | 11.20 | 5.60 | 5.75 | 2.80 |
| 90 | 14.84 | 12.46 | 11.07 | 11.07 | 5.53 | 5.69 | 2.77 |
| 91 | 13.69 | 12.32 | 10.95 | | 5.47 | 5.63 | 2.74 |
| 92 | 13.54 | 12.19 | 10.83 | | 5.41 | 5.57 | 2.71 |
| 93 | 13.40 | 12.06 | 10.72 | | 5.35 | 5.51 | 2.68 |
| 94 | 13.26 | 11.93 | 10.60 | | 5.30 | 5.45 | 2.65 |
| Change | Change | Change | Change | Change | Change | Change | Change |
| Gears | Gears | Gears | Gears | Gears | Gears | Gears | Gears |
| 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame |
| 24-94 T | 30-94 T | 30-94 T | 40-88 T | 15-94 T | 28-94 T | 30-94 T | |
| 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame |
| 15-70 T | 15-86 T | 15-86 T | 24-90 T | 15-94 T | 15-94 T | 15-94 T | |
| Const's | 1246.18 | 1121.11 | 996.54 | 996.54 | 498.47 | 512.11 | 249.13 |

BAND DRIVE

Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter

Cylinder 7 inches Diameter. Ratio Cylinder to Whirl 1 to 6.62
 Whirl $\frac{15}{16}$ inch Diameter. Front Roll Gear 108 Teeth

| Change | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|---------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Gears | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 15 T | 75.86 | 68.25 | 60.66 | | 30.34 | 31.17 | 15.17 |
| 16 | 71.11 | 63.98 | 56.87 | | 28.44 | 29.23 | 14.22 |
| 17 | 66.94 | 60.21 | 53.53 | | 26.77 | 27.51 | 13.38 |
| 18 | 63.21 | 56.87 | 50.55 | | 25.28 | 25.98 | 12.64 |
| 19 | 59.88 | 53.87 | 47.89 | | 23.95 | 24.61 | 11.97 |
| 20 | 56.89 | 51.18 | 45.50 | | 22.75 | 23.38 | 11.37 |
| 21 | 54.18 | 48.74 | 43.33 | | 21.67 | 22.27 | 10.83 |
| 22 | 51.72 | 46.53 | 41.36 | | 20.68 | 21.26 | 10.34 |
| 23 | 49.47 | 44.50 | 39.56 | | 19.78 | 20.33 | 9.89 |
| 24 | 47.41 | 42.65 | 37.91 | 37.91 | 18.96 | 19.48 | 9.48 |
| 25 | 45.51 | 40.94 | 36.40 | 36.40 | 18.20 | 18.70 | 9.10 |
| 26 | 43.76 | 39.37 | 35.00 | 35.00 | 17.50 | 17.99 | 8.75 |
| 27 | 42.14 | 37.91 | 33.70 | 33.70 | 16.85 | 17.32 | 8.43 |
| 28 | 40.63 | 36.56 | 32.50 | 32.50 | 16.25 | 16.70 | 8.12 |
| 29 | 39.23 | 35.29 | 31.38 | 31.38 | 15.69 | 16.12 | 7.84 |
| 30 | 37.92 | 34.12 | 30.33 | 30.33 | 15.17 | 15.59 | 7.58 |
| 31 | 36.70 | 33.02 | 29.35 | 29.35 | 14.68 | 15.08 | 7.34 |
| 32 | 35.55 | 31.99 | 28.44 | 28.44 | 14.22 | 14.61 | 7.11 |
| 33 | 34.48 | 31.02 | 27.57 | 27.57 | 13.76 | 14.17 | 6.89 |
| 34 | 33.46 | 30.10 | 26.76 | 26.76 | 13.38 | 13.75 | 6.69 |
| 35 | 32.51 | 29.24 | 26.00 | 26.00 | 13.00 | 13.36 | 6.50 |
| 36 | 31.60 | 28.43 | 25.28 | 25.28 | 12.64 | 12.99 | 6.32 |
| 37 | 30.75 | 27.66 | 24.59 | 24.59 | 12.30 | 12.64 | 6.15 |
| 38 | 29.94 | 26.93 | 23.95 | 23.95 | 11.97 | 12.31 | 5.99 |
| 39 | 29.17 | 26.24 | 23.33 | 23.33 | 11.67 | 11.99 | 5.83 |
| 40 | 28.44 | 25.59 | 22.75 | 22.75 | 11.47 | 11.69 | 5.69 |
| 41 | 27.75 | 24.96 | 22.19 | 22.19 | 11.10 | 11.41 | 5.55 |
| 42 | 27.09 | 24.37 | 21.66 | 21.66 | 10.83 | 11.13 | 5.42 |
| 43 | 26.46 | 23.80 | 21.16 | 21.16 | 10.58 | 10.87 | 5.29 |
| 44 | 25.86 | 23.26 | 20.68 | 20.68 | 10.34 | 10.63 | 5.17 |
| 45 | 25.28 | 22.74 | 20.22 | 20.22 | 10.11 | 10.39 | 5.06 |
| 46 | 24.73 | 22.25 | 19.78 | 19.78 | 9.89 | 10.17 | 4.95 |
| 47 | 24.21 | 21.78 | 19.36 | 19.36 | 9.68 | 9.95 | 4.84 |
| 48 | 23.70 | 21.32 | 18.96 | 18.96 | 9.48 | 9.74 | 4.74 |
| 49 | 23.22 | 20.89 | 18.57 | 18.57 | 9.28 | 9.54 | 4.64 |
| 50 | 22.75 | 20.47 | 18.20 | 18.20 | 9.10 | 9.35 | 4.55 |
| 51 | 22.31 | 20.07 | 17.84 | 17.84 | 8.92 | 9.17 | 4.46 |
| 52 | 21.88 | 19.68 | 17.50 | 17.50 | 8.75 | 8.99 | 4.38 |
| 53 | 21.46 | 19.31 | 17.17 | 17.17 | 8.58 | 8.82 | 4.29 |
| 54 | 21.07 | 18.95 | 16.85 | 16.85 | 8.42 | 8.66 | 4.21 |
| 55 | 20.68 | 18.61 | 16.54 | 16.54 | 8.27 | 8.50 | 4.14 |
| 56 | 20.31 | 18.28 | 16.25 | 16.25 | 8.12 | 8.35 | 4.06 |
| 57 | 19.96 | 17.95 | 15.96 | 15.96 | 7.98 | 8.20 | 3.99 |
| 58 | 19.61 | 17.64 | 15.69 | 15.69 | 7.84 | 8.06 | 3.92 |
| Const's | 1137.89 | 1023.69 | 909.94 | 909.94 | 455.16 | 467.61 | 227.48 |

BAND DRIVE Spinning Twist Gear Table

FRONT ROLL 1 inch Diameter

Cylinder 7 inches diameter. Ratio Cylinder to Whirl 1 to 6.62
Whirl $\frac{15}{13}$ inch diameter. Front Roll gear 108 teeth

| Change Gears | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|-----------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 59T | 19.28 | 17.35 | 15.42 | 15.42 | 7.71 | 7.93 | 3.86 |
| 60 | 18.96 | 17.06 | 15.17 | 15.17 | 7.58 | 7.79 | 3.79 |
| 61 | 18.65 | 16.78 | 14.92 | 14.92 | 7.46 | 7.67 | 3.73 |
| 62 | 18.35 | 16.51 | 14.68 | 14.68 | 7.34 | 7.54 | 3.67 |
| 63 | 18.06 | 16.24 | 14.44 | 14.44 | 7.22 | 7.42 | 3.61 |
| 64 | 17.77 | 15.91 | 14.22 | 14.22 | 7.11 | 7.31 | 3.55 |
| 65 | 17.50 | 15.74 | 14.00 | 14.00 | 7.00 | 7.19 | 3.50 |
| 66 | 17.24 | 15.51 | 13.79 | 13.79 | 6.89 | 7.09 | 3.45 |
| 67 | 16.98 | 15.27 | 13.58 | 13.58 | 6.79 | 6.98 | 3.40 |
| 68 | 16.73 | 15.05 | 13.38 | 13.38 | 6.69 | 6.88 | 3.35 |
| 69 | 16.49 | 14.83 | 13.19 | 13.19 | 6.59 | 6.78 | 3.29 |
| 70 | 16.25 | 14.62 | 13.00 | 13.00 | 6.50 | 6.68 | 3.25 |
| 71 | 16.02 | 14.41 | 12.82 | 12.82 | 6.41 | 6.59 | 3.21 |
| 72 | 15.80 | 14.21 | 12.63 | 12.63 | 6.32 | 6.49 | 3.16 |
| 73 | 15.58 | 14.02 | 12.46 | 12.46 | 6.23 | 6.41 | 3.12 |
| 74 | 15.37 | 13.83 | 12.30 | 12.30 | 6.15 | 6.32 | 3.07 |
| 75 | 15.17 | 13.65 | 12.13 | 12.13 | 6.06 | 6.23 | 3.03 |
| 76 | 14.97 | 13.47 | 11.97 | 11.97 | 5.98 | 6.15 | 2.99 |
| 77 | 14.78 | 13.30 | 11.82 | 11.82 | 5.91 | 6.07 | 2.95 |
| 78 | 14.59 | 13.13 | 11.67 | 11.67 | 5.83 | 6.00 | 2.92 |
| 79 | 14.40 | 12.96 | 11.52 | 11.52 | 5.76 | 5.92 | 2.89 |
| 80 | 14.22 | 12.80 | 11.37 | 11.37 | 5.68 | 5.84 | 2.84 |
| 81 | 14.05 | 12.64 | 11.23 | 11.23 | 5.61 | 5.77 | 2.81 |
| 82 | 13.88 | 12.48 | 11.10 | 11.10 | 5.55 | 5.70 | 2.77 |
| 83 | 13.71 | 12.33 | 10.96 | 10.96 | 5.48 | 5.63 | 2.74 |
| 84 | 13.55 | 12.19 | 10.83 | 10.83 | 5.41 | 5.57 | 2.71 |
| 85 | 13.39 | 12.05 | 10.71 | 10.71 | 5.35 | 5.50 | 2.68 |
| 86 | 13.23 | 11.81 | 10.58 | 10.58 | 5.29 | 5.44 | 2.65 |
| 87 | 13.08 | 11.77 | 10.46 | 10.46 | 5.23 | 5.37 | 2.61 |
| 88 | 12.93 | 11.64 | 10.34 | 10.34 | 5.17 | 5.31 | 2.58 |
| 89 | 12.78 | 11.51 | 10.22 | 10.22 | 5.11 | 5.25 | 2.56 |
| 90 | 12.64 | 11.38 | 10.11 | 10.11 | 5.05 | 5.20 | 2.53 |
| 91 | 12.50 | 11.25 | 10.00 | | 5.00 | 5.14 | 2.50 |
| 92 | 12.37 | 11.13 | 9.89 | | 4.94 | 5.08 | 2.47 |
| 93 | 12.24 | 11.01 | 9.78 | | 4.89 | 5.03 | 2.45 |
| 94 | 12.11 | 10.89 | 9.68 | | 4.84 | 4.97 | 2.42 |
| | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears |
| | 36" Frame 24-94 T | 36" Frame 30-94 T | 36" Frame 30-94 T | 36" Frame 40-88 T | 36" Frame 15-94 T | 36" Frame 28-94 T | 36" Frame 30-94 T |
| | 39" Frame 15-70 T | 39" Frame 15-86 T | 39" Frame 15-86 T | 39" Frame 24-90 T | 39" Frame 15-94 T | 39" Frame 15-94 T | 39" Frame |
| Const's | 1137.89 | 1023.69 | 909.94 | 909.94 | 455.16 | 467.61 | 227.48 |

BAND DRIVE Spinning Twist Gear Table.

FRONT ROLL 1 Inch Diameter.

Cylinder 7 inches Diameter. Ratio Cylinder to Whirl 1 to 6.24
Whirl 1 inch Diameter. Front Roll Gear 108 Teeth

| Change | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|---------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Gears | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 15T | 71.51 | 64.33 | 57.18 | | 28.60 | 29.38 | 14.29 |
| 16 | 67.03 | 60.30 | 53.61 | | 26.81 | 27.55 | 13.40 |
| 17 | 63.09 | 56.76 | 50.45 | | 25.23 | 25.93 | 12.61 |
| 18 | 59.58 | 53.60 | 47.65 | | 23.83 | 24.48 | 11.91 |
| 19 | 56.45 | 50.79 | 45.14 | | 22.58 | 23.20 | 11.28 |
| 20 | 53.62 | 48.24 | 42.88 | | 21.45 | 22.04 | 10.72 |
| 21 | 51.07 | 45.94 | 40.84 | | 20.43 | 20.99 | 10.21 |
| 22 | 48.75 | 43.86 | 38.99 | | 19.50 | 20.04 | 9.75 |
| 23 | 46.63 | 41.95 | 37.29 | | 18.65 | 19.16 | 9.32 |
| 24 | 44.69 | 40.20 | 35.74 | 35.74 | 17.87 | 18.37 | 8.93 |
| 25 | 42.90 | 38.59 | 34.31 | 34.31 | 17.16 | 17.63 | 8.58 |
| 26 | 41.25 | 37.11 | 32.99 | 32.99 | 16.50 | 16.95 | 8.25 |
| 27 | 39.72 | 35.73 | 31.77 | 31.77 | 15.89 | 16.32 | 7.94 |
| 28 | 38.30 | 34.46 | 30.63 | 30.63 | 15.32 | 15.74 | 7.66 |
| 29 | 36.98 | 33.27 | 29.58 | 29.58 | 14.79 | 15.20 | 7.39 |
| 30 | 35.75 | 32.16 | 28.59 | 28.59 | 14.30 | 14.69 | 7.15 |
| 31 | 34.59 | 31.12 | 27.67 | 27.67 | 13.83 | 14.22 | 6.92 |
| 32 | 33.55 | 30.15 | 26.80 | 26.80 | 13.40 | 13.77 | 6.70 |
| 33 | 32.50 | 29.24 | 25.99 | 25.99 | 13.00 | 13.36 | 6.50 |
| 34 | 31.54 | 28.38 | 25.23 | 25.23 | 12.61 | 12.97 | 6.31 |
| 35 | 30.64 | 27.56 | 24.51 | 24.51 | 12.25 | 12.59 | 6.13 |
| 36 | 29.79 | 26.80 | 23.82 | 23.82 | 11.91 | 12.24 | 5.96 |
| 37 | 28.98 | 26.07 | 23.18 | 23.18 | 11.59 | 11.91 | 5.80 |
| 38 | 28.22 | 25.39 | 22.57 | 22.57 | 11.29 | 11.60 | 5.64 |
| 39 | 27.50 | 24.74 | 21.99 | 21.99 | 11.00 | 11.30 | 5.50 |
| 40 | 26.81 | 24.12 | 21.44 | 21.44 | 10.72 | 11.02 | 5.36 |
| 41 | 26.16 | 23.53 | 20.92 | 20.92 | 10.46 | 10.75 | 5.23 |
| 42 | 25.53 | 22.97 | 20.42 | 20.42 | 10.21 | 10.49 | 5.11 |
| 43 | 24.94 | 22.44 | 19.95 | 19.95 | 9.97 | 10.25 | 4.99 |
| 44 | 24.37 | 21.93 | 19.49 | 19.49 | 9.75 | 10.02 | 4.87 |
| 45 | 23.83 | 21.44 | 19.06 | 19.06 | 9.53 | 9.79 | 4.77 |
| 46 | 23.31 | 20.97 | 18.65 | 18.65 | 9.32 | 9.58 | 4.66 |
| 47 | 22.82 | 20.53 | 18.25 | 18.25 | 9.12 | 9.38 | 4.56 |
| 48 | 22.34 | 20.10 | 17.87 | 17.87 | 8.93 | 9.18 | 4.47 |
| 49 | 21.88 | 19.69 | 17.50 | 17.50 | 8.75 | 9.00 | 4.38 |
| 50 | 21.45 | 19.29 | 17.15 | 17.15 | 8.58 | 8.82 | 4.29 |
| 51 | 21.03 | 18.92 | 16.82 | 16.82 | 8.41 | 8.64 | 4.20 |
| 52 | 20.62 | 18.55 | 16.49 | 16.49 | 8.25 | 8.48 | 4.12 |
| 53 | 20.23 | 18.20 | 16.18 | 16.18 | 8.09 | 8.32 | 4.05 |
| 54 | 19.86 | 17.86 | 15.88 | 15.88 | 7.94 | 8.16 | 3.97 |
| 55 | 19.50 | 17.54 | 15.59 | 15.59 | 7.80 | 8.01 | 3.90 |
| 56 | 19.15 | 17.23 | 15.32 | 15.32 | 7.66 | 7.87 | 3.83 |
| 57 | 18.81 | 16.92 | 15.05 | 15.05 | 7.52 | 7.73 | 3.76 |
| 58 | 18.49 | 16.63 | 14.79 | 14.79 | 7.39 | 7.60 | 3.70 |
| Const's | 1072.57 | 964.93 | 857.71 | 857.71 | 429.03 | 440.77 | 214.42 |

BAND DRIVE

Spinning Twist Gear Table

FRONT ROLL 1 inch Diameter

Cylinder 7 inches diameter. Ratio Cylinder to Whirl 1 to 6.24.
 Whirl 1 inch diameter. Front Roll gear 108 teeth

| Change Gears | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|----------------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 59 | 18.17 | 16.35 | 14.54 | 14.54 | 7.27 | 7.47 | 3.63 |
| 60 | 17.87 | 16.08 | 14.29 | 14.29 | 7.15 | 7.35 | 3.57 |
| 61 | 17.58 | 15.81 | 14.06 | 14.06 | 7.03 | 7.23 | 3.52 |
| 62 | 17.29 | 15.56 | 13.83 | 13.83 | 6.91 | 7.11 | 3.46 |
| 63 | 17.02 | 15.31 | 13.61 | 13.61 | 6.81 | 7.00 | 3.40 |
| 64 | 16.75 | 15.07 | 13.40 | 13.40 | 6.70 | 6.89 | 3.35 |
| 65 | 16.50 | 14.84 | 13.19 | 13.19 | 6.60 | 6.78 | 3.30 |
| 66 | 16.25 | 14.62 | 13.00 | 13.00 | 6.50 | 6.68 | 3.25 |
| 67 | 16.00 | 14.40 | 12.80 | 12.80 | 6.40 | 6.58 | 3.20 |
| 68 | 15.77 | 14.19 | 12.61 | 12.61 | 6.30 | 6.48 | 3.15 |
| 69 | 15.54 | 13.98 | 12.43 | 12.43 | 6.21 | 6.39 | 3.11 |
| 70 | 15.32 | 13.78 | 12.25 | 12.25 | 6.12 | 6.30 | 3.06 |
| 71 | 15.10 | 13.59 | 12.08 | 12.08 | 6.04 | 6.21 | 3.02 |
| 72 | 14.89 | 13.40 | 11.91 | 11.91 | 5.95 | 6.12 | 2.98 |
| 73 | 14.69 | 13.21 | 11.75 | 11.75 | 5.87 | 6.04 | 2.94 |
| 74 | 14.49 | 13.04 | 11.59 | 11.59 | 5.79 | 5.96 | 2.90 |
| 75 | 14.30 | 12.87 | 11.44 | 11.44 | 5.72 | 5.88 | 2.86 |
| 76 | 14.12 | 12.70 | 11.29 | 11.29 | 5.64 | 5.80 | 2.82 |
| 77 | 13.94 | 12.53 | 11.14 | 11.14 | 5.57 | 5.72 | 2.78 |
| 78 | 13.76 | 12.37 | 11.00 | 11.00 | 5.50 | 5.65 | 2.75 |
| 79 | 13.59 | 12.21 | 10.86 | 10.86 | 5.43 | 5.58 | 2.71 |
| 80 | 13.41 | 12.06 | 10.72 | 10.72 | 5.36 | 5.51 | 2.68 |
| 81 | 13.25 | 11.91 | 10.59 | 10.59 | 5.29 | 5.44 | 2.65 |
| 82 | 12.09 | 11.76 | 10.46 | 10.46 | 5.23 | 5.38 | 2.62 |
| 83 | 12.92 | 11.61 | 10.33 | 10.33 | 5.16 | 5.31 | 2.58 |
| 84 | 12.77 | 11.48 | 10.21 | 10.21 | 5.10 | 5.25 | 2.55 |
| 85 | 12.62 | 11.35 | 10.09 | 10.09 | 5.04 | 5.19 | 2.52 |
| 86 | 12.47 | 11.22 | 9.97 | 9.97 | 4.98 | 5.13 | 2.49 |
| 87 | 12.33 | 11.09 | 9.86 | 9.86 | 4.93 | 5.06 | 2.46 |
| 88 | 12.19 | 10.96 | 9.75 | 9.75 | 4.87 | 5.01 | 2.44 |
| 89 | 12.05 | 10.84 | 9.64 | 9.64 | 4.82 | 4.95 | 2.41 |
| 90 | 12.92 | 10.72 | 9.53 | 9.53 | 4.76 | 4.90 | 2.38 |
| 91 | 11.79 | 10.60 | 9.43 | | 4.71 | 4.84 | 2.36 |
| 92 | 11.66 | 10.49 | 9.32 | | 4.66 | 4.79 | 2.33 |
| 93 | 11.53 | 10.38 | 9.22 | | 4.61 | 4.74 | 2.31 |
| 94 | 11.41 | 10.27 | 9.12 | | 4.56 | 4.69 | 2.28 |
| Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears |
| 36" Frame 24-94 T | 36" Frame 30-94 T | 36" Frame 30-94 T | 36" Frame 40-88 T | 36" Frame 15-94 T | 36" Frame 28-94 T | 36" Frame 30-94 T | |
| 39" Frame 15-70 T | 39" Frame 15-86 T | 39" Frame 15-86 T | 39" Frame 24-90 T | 39" Frame 15-94 T | 39" Frame 15-94 T | 39" Frame 15-94 T | |
| Const's | 1072.57 | 964.93 | 857.71 | 857.71 | 429.03 | 440.77 | 214.42 |

BAND DRIVE Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter.

Cylinder 7 inch Diameter.

Ratio Cylinder to Whirl 1 to 5.86.

Whirl $1\frac{1}{16}$ inch Diameter.

Front Roll Gear 108 Teeth.

| Change | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|---------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Gears | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 15 T | 67.15 | 60.41 | 53.70 | | 26.86 | 27.59 | 13.42 |
| 16 | 62.95 | 56.63 | 50.34 | | 25.18 | 25.87 | 12.59 |
| 17 | 59.25 | 53.30 | 47.33 | | 23.70 | 24.35 | 11.84 |
| 18 | 55.95 | 50.34 | 44.75 | | 22.38 | 22.99 | 11.19 |
| 19 | 53.01 | 47.60 | 43.29 | | 21.20 | 21.79 | 10.60 |
| 20 | 50.36 | 45.30 | 40.27 | | 20.14 | 20.70 | 10.07 |
| 21 | 47.96 | 43.15 | 38.36 | | 19.18 | 19.71 | 9.59 |
| 22 | 45.78 | 41.18 | 36.61 | | 18.31 | 18.81 | 9.15 |
| 23 | 43.79 | 39.39 | 35.02 | | 17.52 | 18.00 | 8.76 |
| 24 | 41.96 | 37.75 | 33.56 | 33.56 | 16.78 | 17.25 | 8.39 |
| 25 | 40.29 | 36.24 | 32.22 | 32.22 | 16.11 | 16.56 | 8.06 |
| 26 | 38.74 | 34.85 | 30.98 | 30.98 | 15.49 | 15.92 | 7.75 |
| 27 | 37.39 | 33.56 | 29.83 | 29.83 | 14.84 | 15.33 | 7.47 |
| 28 | 35.97 | 32.36 | 28.77 | 28.77 | 14.38 | 14.78 | 7.19 |
| 29 | 34.73 | 31.24 | 27.77 | 27.77 | 13.88 | 14.27 | 6.94 |
| 30 | 33.57 | 30.20 | 26.85 | 26.85 | 13.43 | 13.80 | 6.71 |
| 31 | 32.49 | 29.23 | 25.98 | 25.98 | 12.99 | 13.35 | 6.50 |
| 32 | 31.47 | 28.31 | 25.17 | 25.17 | 12.59 | 12.94 | 6.29 |
| 33 | 30.52 | 27.45 | 24.41 | 24.41 | 12.20 | 12.54 | 6.10 |
| 34 | 29.62 | 26.65 | 23.69 | 23.69 | 11.85 | 12.17 | 5.92 |
| 35 | 28.77 | 25.89 | 23.01 | 23.01 | 11.51 | 11.82 | 5.75 |
| 36 | 27.97 | 25.17 | 22.37 | 22.37 | 11.19 | 11.50 | 5.59 |
| 37 | 27.22 | 24.49 | 21.77 | 21.77 | 10.88 | 11.19 | 5.44 |
| 38 | 26.50 | 23.84 | 21.20 | 21.20 | 10.60 | 10.89 | 5.30 |
| 39 | 25.82 | 23.23 | 20.65 | 20.65 | 10.33 | 10.61 | 5.16 |
| 40 | 25.18 | 22.65 | 20.14 | 20.14 | 10.07 | 10.35 | 5.04 |
| 41 | 24.56 | 22.10 | 19.65 | 19.65 | 9.82 | 10.09 | 4.91 |
| 42 | 23.98 | 21.57 | 19.18 | 19.18 | 9.59 | 9.86 | 4.80 |
| 43 | 23.42 | 21.07 | 18.73 | 18.73 | 9.36 | 9.63 | 4.68 |
| 44 | 22.88 | 20.59 | 18.31 | 18.31 | 9.15 | 9.41 | 4.58 |
| 45 | 22.38 | 20.13 | 17.90 | 17.90 | 8.95 | 9.20 | 4.48 |
| 46 | 21.89 | 19.69 | 17.51 | 17.51 | 8.75 | 9.00 | 4.38 |
| 47 | 21.43 | 19.28 | 17.14 | 17.14 | 8.57 | 8.81 | 4.29 |
| 48 | 20.98 | 18.87 | 16.78 | 16.78 | 8.39 | 8.62 | 4.20 |
| 49 | 20.55 | 18.49 | 16.44 | 16.44 | 8.22 | 8.45 | 4.11 |
| 50 | 20.14 | 18.12 | 16.11 | 16.11 | 8.05 | 8.28 | 4.03 |
| 51 | 19.75 | 17.76 | 15.79 | 15.79 | 7.90 | 8.12 | 3.95 |
| 52 | 19.37 | 17.42 | 15.49 | 15.49 | 7.74 | 7.96 | 3.87 |
| 53 | 19.00 | 17.09 | 15.20 | 15.20 | 7.60 | 7.81 | 3.80 |
| 54 | 18.65 | 16.78 | 14.92 | 14.92 | 7.46 | 7.67 | 3.73 |
| 55 | 18.31 | 16.47 | 14.64 | 14.64 | 7.32 | 7.53 | 3.66 |
| 56 | 17.98 | 16.18 | 14.38 | 14.38 | 7.19 | 7.39 | 3.60 |
| 57 | 17.67 | 15.89 | 14.13 | 14.13 | 7.06 | 7.26 | 3.53 |
| 58 | 17.36 | 15.62 | 13.89 | 13.89 | 6.94 | 7.14 | 3.47 |
| Const's | 1007.25 | 906.16 | 805.48 | 805.48 | 402.90 | 413.92 | 201.37 |

BAND DRIVE

Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter.

Cylinder 7 inch Diameter.

Ratio Cylinder to Whirl 1 to 5.86.

Whirl $1\frac{1}{16}$ inch Diameter.

Front Roll Gear 108 Teeth.

| Change Gears | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|-----------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 57T | 17.07 | 15.35 | 13.65 | 13.65 | 6.82 | 7.02 | 3.41 |
| 60 | 16.78 | 15.10 | 13.42 | 13.42 | 6.71 | 6.90 | 3.36 |
| 61 | 16.61 | 14.85 | 13.20 | 13.20 | 6.60 | 6.78 | 3.39 |
| 62 | 16.24 | 14.61 | 12.93 | 13.90 | 6.49 | 6.68 | 3.25 |
| 63 | 15.98 | 14.38 | 12.79 | 12.79 | 6.39 | 6.57 | 3.29 |
| 64 | 15.73 | 14.15 | 12.59 | 12.59 | 6.29 | 6.47 | 3.15 |
| 65 | 15.49 | 13.94 | 12.39 | 12.39 | 6.19 | 6.37 | 3.10 |
| 66 | 15.26 | 13.72 | 12.20 | 12.20 | 6.10 | 6.27 | 3.05 |
| 67 | 15.03 | 13.52 | 12.02 | 12.02 | 6.01 | 6.18 | 3.01 |
| 68 | 14.81 | 13.32 | 11.85 | 11.85 | 5.92 | 6.09 | 2.96 |
| 69 | 14.59 | 13.13 | 11.67 | 11.67 | 5.83 | 6.00 | 2.92 |
| 70 | 14.38 | 12.94 | 11.51 | 11.51 | 5.75 | 5.91 | 2.88 |
| 71 | 14.18 | 12.76 | 11.34 | 11.34 | 5.67 | 5.83 | 2.84 |
| 72 | 13.98 | 12.58 | 11.19 | 11.19 | 5.59 | 5.75 | 2.80 |
| 73 | 13.79 | 12.41 | 11.03 | 11.03 | 5.51 | 5.67 | 2.76 |
| 74 | 13.61 | 12.24 | 10.88 | 10.88 | 5.44 | 5.59 | 2.72 |
| 75 | 13.43 | 12.08 | 10.74 | 10.74 | 5.37 | 5.52 | 2.68 |
| 76 | 13.26 | 11.92 | 10.60 | 10.60 | 5.30 | 5.45 | 2.65 |
| 77 | 13.09 | 11.77 | 10.46 | 10.46 | 5.23 | 5.38 | 2.62 |
| 78 | 12.92 | 11.62 | 10.33 | 10.33 | 5.16 | 5.31 | 2.58 |
| 79 | 12.75 | 11.47 | 10.20 | 10.20 | 5.10 | 5.24 | 2.55 |
| 80 | 12.59 | 11.33 | 10.07 | 10.07 | 5.03 | 5.17 | 2.52 |
| 81 | 12.44 | 11.19 | 9.94 | 9.94 | 4.97 | 5.11 | 2.49 |
| 82 | 12.29 | 11.05 | 9.82 | 9.82 | 4.91 | 5.05 | 2.46 |
| 83 | 12.14 | 10.92 | 9.70 | 9.70 | 4.85 | 4.99 | 2.43 |
| 84 | 12.00 | 10.79 | 9.59 | 9.59 | 4.79 | 4.93 | 2.40 |
| 85 | 12.86 | 10.66 | 9.48 | 9.48 | 4.74 | 4.87 | 2.37 |
| 86 | 12.72 | 10.53 | 9.37 | 9.37 | 4.68 | 4.81 | 2.34 |
| 87 | 11.58 | 10.41 | 9.26 | 9.26 | 4.63 | 4.76 | 2.31 |
| 88 | 11.45 | 10.29 | 9.15 | 9.15 | 4.57 | 4.70 | 2.29 |
| 89 | 11.32 | 10.18 | 9.05 | 9.05 | 4.51 | 4.65 | 2.26 |
| 90 | 11.19 | 10.07 | 8.95 | 8.95 | 4.47 | 4.60 | 2.24 |
| 91 | 11.07 | 9.96 | 8.85 | | 4.42 | 4.55 | 2.21 |
| 92 | 10.95 | 9.85 | 8.76 | | 4.37 | 4.50 | 2.19 |
| 93 | 10.83 | 9.74 | 8.66 | | 4.33 | 4.45 | 2.17 |
| 94 | 10.72 | 9.64 | 8.57 | | 4.28 | 4.40 | 2.14 |
| Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears |
| 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame |
| 24-94 T | 30-94 T | 30-94 T | 40-88 T | 15-94 T | 28-94 T | 30-94 T | |
| 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | |
| 15-70 T | 15-86 T | 15-86 T | 24-90 T | 15-94 T | 15-94 T | 15-94 T | |
| Const's | 1007.25 | 906.16 | 805.48 | 805.48 | 492.90 | 413.92 | 291.37 |

BAND DRIVE

Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter.

Cylinder 7 inch Diameter. **Ratio Cylinder to Whirl 1 to 5.43.**

Whirl 1½ inch Diameter. **Front Roll Gear 108 Teeth.**

| Change | Cyl. 20 T | Cyl. 20 T | Cyl. 22 T | Cyl. 20 T | Cyl. 40 T | Cyl. 36 T | Cyl. 55 T |
|---------|------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Gears | Stud 100 T | Stud 90 T | Stud 88 T | Stud 80 T | Stud 80 T | Stud 74 T | Stud 55 T |
| | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 15T | 62.22 | 55.98 | 49.76 | | 24.89 | 25.57 | 12.44 |
| 16 | 58.33 | 52.47 | 47.14 | | 23.33 | 24.22 | 11.78 |
| 17 | 54.90 | 49.39 | 44.52 | | 21.96 | 22.87 | 11.12 |
| 18 | 51.85 | 46.64 | 41.90 | | 20.74 | 21.53 | 10.47 |
| 19 | 49.12 | 44.19 | 39.28 | | 19.64 | 20.19 | 9.82 |
| 20 | 46.66 | 41.98 | 37.57 | | 18.66 | 19.31 | 9.39 |
| 21 | 44.44 | 39.98 | 35.87 | | 17.77 | 18.43 | 8.96 |
| 22 | 42.42 | 38.16 | 34.17 | | 16.97 | 17.55 | 8.53 |
| 23 | 40.58 | 36.50 | 32.45 | | 16.23 | 16.68 | 8.11 |
| 24 | 38.88 | 34.98 | 31.24 | 31.24 | 15.55 | 16.06 | 7.81 |
| 25 | 37.33 | 33.58 | 30.04 | 30.04 | 14.93 | 15.44 | 7.51 |
| 26 | 35.80 | 32.29 | 28.84 | 28.84 | 14.38 | 14.82 | 7.21 |
| 27 | 34.56 | 31.09 | 27.64 | 27.64 | 13.83 | 14.21 | 6.91 |
| 28 | 33.33 | 29.98 | 26.75 | 26.75 | 13.38 | 13.75 | 6.68 |
| 29 | 32.18 | 28.95 | 25.86 | 25.86 | 12.93 | 13.29 | 6.46 |
| 30 | 31.11 | 27.98 | 24.97 | 24.97 | 12.48 | 12.83 | 6.24 |
| 31 | 30.10 | 27.08 | 24.08 | 24.08 | 12.04 | 12.37 | 6.02 |
| 32 | 29.16 | 26.14 | 23.39 | 23.39 | 11.66 | 12.01 | 5.84 |
| 33 | 28.28 | 25.44 | 22.70 | 22.70 | 11.31 | 11.66 | 5.68 |
| 34 | 27.45 | 24.69 | 22.01 | 22.01 | 10.98 | 11.31 | 5.52 |
| 35 | 26.66 | 23.99 | 21.32 | 21.32 | 10.66 | 10.96 | 5.33 |
| 36 | 25.92 | 23.32 | 20.77 | 20.77 | 10.37 | 10.67 | 5.19 |
| 37 | 25.22 | 22.69 | 20.22 | 20.22 | 10.09 | 10.39 | 5.05 |
| 38 | 24.56 | 22.09 | 19.68 | 19.68 | 9.82 | 10.11 | 4.91 |
| 39 | 23.93 | 21.53 | 19.14 | 19.14 | 9.57 | 9.83 | 4.78 |
| 40 | 23.33 | 20.99 | 18.69 | 18.69 | 9.33 | 9.60 | 4.67 |
| 41 | 22.76 | 20.47 | 18.24 | 18.24 | 9.10 | 9.37 | 4.56 |
| 42 | 22.22 | 19.99 | 17.80 | 17.80 | 8.88 | 9.14 | 4.45 |
| 43 | 21.70 | 19.52 | 17.36 | 17.36 | 8.68 | 8.92 | 4.34 |
| 44 | 21.21 | 19.08 | 16.99 | 16.99 | 8.48 | 8.73 | 4.24 |
| 45 | 20.74 | 18.65 | 16.62 | 16.62 | 8.29 | 8.54 | 4.15 |
| 46 | 20.29 | 18.25 | 16.25 | 16.25 | 8.11 | 8.35 | 4.06 |
| 47 | 19.85 | 17.86 | 15.88 | 15.88 | 7.94 | 8.16 | 3.97 |
| 48 | 19.44 | 17.49 | 15.56 | 15.56 | 7.77 | 8.00 | 3.89 |
| 49 | 19.04 | 17.13 | 15.25 | 15.25 | 7.61 | 7.84 | 3.81 |
| 50 | 18.66 | 16.79 | 14.94 | 14.94 | 7.46 | 7.68 | 3.73 |
| 51 | 18.30 | 16.46 | 14.63 | 14.63 | 7.32 | 7.52 | 3.66 |
| 52 | 17.94 | 16.14 | 14.36 | 14.36 | 7.17 | 7.38 | 3.59 |
| 53 | 17.61 | 15.84 | 14.09 | 14.09 | 7.04 | 7.24 | 3.52 |
| 54 | 17.28 | 15.54 | 13.83 | 13.83 | 6.91 | 7.10 | 3.45 |
| 55 | 16.96 | 15.26 | 13.57 | 13.57 | 6.78 | 6.97 | 3.39 |
| 56 | 16.66 | 14.99 | 13.34 | 13.34 | 6.66 | 6.85 | 3.33 |
| 57 | 16.37 | 14.73 | 13.11 | 12.11 | 6.54 | 6.73 | 3.27 |
| 58 | 16.09 | 14.47 | 12.88 | 11.88 | 6.43 | 6.61 | 3.21 |
| Const's | 933.34 | 839.67 | 746.37 | 746.37 | 373.33 | 383.55 | 186.59 |

BAND DRIVE Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter.

Cylinder 7 inch Diameter. Ratio Cylinder to Whirl 1 to 5.43.

Whirl 1½ inch Diameter. Front Roll Gear 108 Teeth

| Change Gears | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|-----------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 59T | 15.81 | 14.23 | 12.65 | 12.65 | 6.32 | 6.50 | 3.16 |
| 60 | 15.55 | 13.99 | 12.45 | 12.45 | 6.22 | 6.39 | 3.11 |
| 61 | 15.30 | 13.76 | 12.25 | 12.25 | 6.12 | 6.29 | 3.06 |
| 62 | 15.05 | 13.54 | 12.05 | 12.05 | 6.02 | 6.19 | 3.01 |
| 63 | 14.81 | 13.32 | 11.85 | 11.85 | 5.92 | 6.09 | 2.96 |
| 64 | 14.58 | 13.11 | 11.67 | 11.67 | 5.83 | 5.99 | 2.91 |
| 65 | 14.35 | 12.90 | 11.49 | 11.49 | 5.74 | 5.90 | 2.86 |
| 66 | 14.14 | 12.72 | 11.31 | 11.31 | 5.65 | 5.81 | 2.82 |
| 67 | 13.93 | 12.53 | 11.14 | 11.14 | 5.57 | 5.72 | 2.78 |
| 68 | 13.72 | 12.34 | 10.98 | 10.98 | 5.49 | 5.64 | 2.74 |
| 69 | 13.52 | 12.16 | 10.82 | 10.82 | 5.41 | 5.56 | 2.70 |
| 70 | 13.33 | 11.99 | 10.66 | 10.66 | 5.33 | 5.48 | 2.66 |
| 71 | 13.14 | 11.82 | 10.51 | 10.51 | 5.25 | 5.40 | 2.63 |
| 72 | 12.96 | 11.66 | 10.37 | 10.37 | 5.18 | 5.32 | 2.59 |
| 73 | 12.78 | 11.50 | 10.23 | 10.23 | 5.11 | 5.25 | 2.56 |
| 74 | 12.61 | 11.35 | 10.09 | 10.09 | 5.04 | 5.18 | 2.52 |
| 75 | 12.44 | 11.20 | 9.95 | 9.95 | 4.97 | 5.11 | 2.49 |
| 76 | 12.28 | 11.05 | 9.82 | 9.82 | 4.90 | 5.04 | 2.45 |
| 77 | 12.12 | 10.91 | 9.69 | 9.69 | 4.84 | 4.98 | 2.42 |
| 78 | 11.96 | 10.77 | 9.57 | 9.57 | 4.78 | 4.92 | 2.39 |
| 79 | 11.81 | 10.63 | 9.45 | 9.45 | 4.72 | 4.86 | 2.36 |
| 80 | 11.66 | 10.50 | 9.33 | 9.33 | 4.66 | 4.80 | 2.33 |
| 81 | 11.52 | 10.37 | 9.21 | 9.21 | 4.60 | 4.74 | 2.30 |
| 82 | 11.38 | 10.24 | 9.10 | 9.10 | 4.55 | 4.68 | 2.27 |
| 83 | 11.24 | 10.12 | 8.99 | 8.99 | 4.49 | 4.62 | 2.25 |
| 84 | 11.11 | 10.00 | 8.88 | 8.88 | 4.44 | 4.56 | 2.22 |
| 85 | 10.98 | 9.88 | 8.78 | 8.78 | 4.39 | 4.51 | 2.19 |
| 86 | 10.85 | 9.76 | 8.68 | 8.68 | 4.34 | 4.46 | 2.16 |
| 87 | 10.73 | 9.65 | 8.58 | 8.58 | 4.29 | 4.41 | 2.14 |
| 88 | 10.61 | 9.54 | 8.48 | 8.48 | 4.24 | 4.36 | 2.11 |
| 89 | 10.49 | 9.43 | 8.38 | 8.38 | 4.19 | 4.31 | 2.09 |
| 90 | 10.37 | 9.33 | 8.29 | 8.29 | 4.14 | 4.26 | 2.07 |
| 91 | 10.26 | 9.23 | 8.20 | | 4.10 | 4.21 | 2.05 |
| 92 | 10.15 | 9.13 | 8.11 | | 4.05 | 4.16 | 2.02 |
| 93 | 10.04 | 9.03 | 8.02 | | 4.01 | 4.12 | 1.99 |
| 94 | 9.93 | 8.93 | 7.94 | | 3.97 | 4.08 | 1.97 |
| Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears |
| 36" Frame | 36" Frame | 36" Frame | 36" Frame | 36" Frame | 36" Frame | 36" Frame | 36" Frame |
| 24-94 T | 30-94 T | 30-94 T | 40-88 T | 15-94 T | 28-94 T | 30-94 T | |
| 39" Frame | 39" Frame | 39" Frame | 39" Frame | 39" Frame | 39" Frame | 39" Frame | 39" Frame |
| 15-70 T | 15-86 T | 15-86 T | 24-90 T | 15-94 T | 15-94 T | 15-94 T | |
| Const's | 933.34 | 839.67 | 746.37 | 746.37 | 373.33 | 383.55 | 186.59 |

BAND DRIVE Spinning Twist Gear Table.

FRONT ROLL 1 Inch Diameter.

Cylinder 7 inches Diameter. Ratio Cylinder to Whirl 1 to 4.80
Whirl $1\frac{5}{16}$ inch Diameter. Front Roll Gear 108 Teeth

| Change | Cyl. 20T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|---------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Gears | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 15T | 55.00 | 49.48 | 43.98 | | 22.00 | 22.60 | 11.00 |
| 16 | 51.56 | 46.39 | 41.66 | | 20.62 | 21.41 | 10.42 |
| 17 | 48.53 | 43.66 | 39.35 | | 19.41 | 20.22 | 9.84 |
| 18 | 45.83 | 41.23 | 37.04 | | 18.33 | 19.03 | 9.26 |
| 19 | 43.42 | 39.06 | 34.73 | | 17.36 | 17.84 | 8.68 |
| 20 | 41.25 | 37.11 | 33.22 | | 16.50 | 17.06 | 8.30 |
| 21 | 39.28 | 35.34 | 31.71 | | 15.71 | 16.28 | 7.92 |
| 22 | 37.50 | 33.73 | 30.20 | | 15.00 | 15.51 | 7.54 |
| 23 | 35.87 | 32.27 | 28.69 | | 14.34 | 14.74 | 7.17 |
| 24 | 34.37 | 30.92 | 27.62 | 27.62 | 13.75 | 14.19 | 6.90 |
| 25 | 33.00 | 29.69 | 26.56 | 26.56 | 13.20 | 13.64 | 6.63 |
| 26 | 31.73 | 28.54 | 25.50 | 25.50 | 12.69 | 13.10 | 6.37 |
| 27 | 30.57 | 27.49 | 24.44 | 24.44 | 12.22 | 12.56 | 6.11 |
| 28 | 29.46 | 26.50 | 23.65 | 23.65 | 11.78 | 12.15 | 5.91 |
| 29 | 28.45 | 25.59 | 22.86 | 22.86 | 11.38 | 11.74 | 5.71 |
| 30 | 27.50 | 24.74 | 22.07 | 22.07 | 11.00 | 11.34 | 5.51 |
| 31 | 26.61 | 23.94 | 21.28 | 21.28 | 10.64 | 10.94 | 5.32 |
| 32 | 25.78 | 23.19 | 20.67 | 20.67 | 10.31 | 10.62 | 5.16 |
| 33 | 25.00 | 22.48 | 20.06 | 20.06 | 10.00 | 10.31 | 5.01 |
| 34 | 24.26 | 21.83 | 19.45 | 19.45 | 9.70 | 10.00 | 4.86 |
| 35 | 23.57 | 21.20 | 18.85 | 18.85 | 9.42 | 9.69 | 4.71 |
| 36 | 22.91 | 20.61 | 18.36 | 18.36 | 9.16 | 9.44 | 4.59 |
| 37 | 22.29 | 20.06 | 17.88 | 17.88 | 8.91 | 9.19 | 4.47 |
| 38 | 21.71 | 19.53 | 17.40 | 17.40 | 8.68 | 8.94 | 4.35 |
| 39 | 21.15 | 19.03 | 16.92 | 16.92 | 8.46 | 8.69 | 4.23 |
| 40 | 20.62 | 18.55 | 16.52 | 16.52 | 8.25 | 8.48 | 4.13 |
| 41 | 20.12 | 18.10 | 16.12 | 16.12 | 8.04 | 8.28 | 4.03 |
| 42 | 19.64 | 17.67 | 15.73 | 15.73 | 7.85 | 8.08 | 3.93 |
| 43 | 19.18 | 17.26 | 15.34 | 15.34 | 7.67 | 7.88 | 3.84 |
| 44 | 18.75 | 16.86 | 15.01 | 15.01 | 7.50 | 7.71 | 3.75 |
| 45 | 18.33 | 16.49 | 14.68 | 14.68 | 7.33 | 7.54 | 3.67 |
| 46 | 17.93 | 16.13 | 14.36 | 14.36 | 7.17 | 7.37 | 3.59 |
| 47 | 17.55 | 15.79 | 14.04 | 14.04 | 7.02 | 7.21 | 3.51 |
| 48 | 17.18 | 15.46 | 13.76 | 13.76 | 6.87 | 7.07 | 3.44 |
| 49 | 16.83 | 15.14 | 13.48 | 13.48 | 6.73 | 6.93 | 3.37 |
| 50 | 16.50 | 14.84 | 13.21 | 13.21 | 6.60 | 6.79 | 3.30 |
| 51 | 16.17 | 14.55 | 12.94 | 12.94 | 6.47 | 6.65 | 3.23 |
| 52 | 15.86 | 14.27 | 12.70 | 12.70 | 6.34 | 6.52 | 3.17 |
| 53 | 15.56 | 14.00 | 12.46 | 12.46 | 6.22 | 6.40 | 3.11 |
| 54 | 15.27 | 13.78 | 12.23 | 12.23 | 6.11 | 6.28 | 3.05 |
| 55 | 15.00 | 13.49 | 12.00 | 12.00 | 6.00 | 6.16 | 3.00 |
| 56 | 14.73 | 13.25 | 11.79 | 11.79 | 5.89 | 6.05 | 2.95 |
| 57 | 14.47 | 13.02 | 11.58 | 11.58 | 5.78 | 5.95 | 2.90 |
| 58 | 14.22 | 12.79 | 11.38 | 11.38 | 5.69 | 5.85 | 2.85 |
| Const's | 825.05 | 742.25 | 659.78 | 659.78 | 330.02 | 339.05 | 164.94 |

BAND DRIVE Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter

Cylinder 7 inches Diameter. Ratio Cylinder to Whirl 1 to 4.80
Whirl $1\frac{5}{16}$ inch Diameter Front Roll Gear 108 Teeth

| Change Gears | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|-----------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 59T | 13.98 | 12.57 | 11.18 | 11.18 | 5.59 | 5.75 | 2.80 |
| 60 | 13.75 | 12.37 | 11.00 | 11.00 | 5.50 | 5.65 | 2.75 |
| 61 | 13.52 | 12.16 | 10.82 | 10.82 | 5.41 | 5.56 | 2.70 |
| 62 | 13.30 | 11.97 | 10.64 | 10.64 | 5.32 | 5.47 | 2.66 |
| 63 | 13.09 | 11.78 | 10.47 | 10.47 | 5.23 | 5.38 | 2.62 |
| 64 | 12.89 | 11.59 | 10.31 | 10.31 | 5.15 | 5.30 | 2.58 |
| 65 | 12.69 | 11.42 | 10.15 | 10.15 | 5.07 | 5.22 | 2.54 |
| 66 | 12.50 | 11.24 | 10.00 | 10.00 | 5.00 | 5.14 | 2.50 |
| 67 | 12.31 | 11.07 | 9.85 | 9.85 | 4.92 | 5.06 | 2.46 |
| 68 | 12.13 | 10.91 | 9.71 | 9.71 | 4.85 | 4.99 | 2.42 |
| 69 | 11.95 | 10.75 | 9.57 | 9.57 | 4.79 | 4.92 | 2.38 |
| 70 | 11.78 | 10.60 | 9.43 | 9.43 | 4.71 | 4.85 | 2.35 |
| 71 | 11.62 | 10.45 | 9.29 | 9.29 | 4.64 | 4.78 | 2.32 |
| 72 | 11.45 | 10.30 | 9.16 | 9.16 | 4.58 | 4.71 | 2.29 |
| 73 | 11.30 | 10.16 | 9.04 | 9.04 | 4.52 | 4.65 | 2.26 |
| 74 | 11.15 | 10.03 | 8.92 | 8.92 | 4.45 | 4.58 | 2.23 |
| 75 | 11.00 | 9.90 | 8.80 | 8.80 | 4.40 | 4.52 | 2.20 |
| 76 | 10.86 | 9.77 | 8.68 | 8.68 | 4.34 | 4.46 | 2.17 |
| 77 | 10.72 | 9.64 | 8.57 | 8.57 | 4.28 | 4.40 | 2.14 |
| 78 | 10.58 | 9.52 | 8.46 | 8.46 | 4.23 | 4.34 | 2.11 |
| 79 | 10.44 | 9.40 | 8.35 | 8.35 | 4.17 | 4.29 | 2.09 |
| 80 | 10.31 | 9.28 | 8.25 | 8.25 | 4.12 | 4.23 | 2.06 |
| 81 | 10.18 | 9.16 | 8.15 | 8.15 | 4.07 | 4.18 | 2.03 |
| 82 | 10.06 | 9.05 | 8.05 | 8.05 | 4.02 | 4.13 | 2.01 |
| 83 | 9.94 | 8.94 | 7.95 | 7.95 | 3.97 | 4.08 | 1.99 |
| 84 | 9.82 | 8.83 | 7.85 | 7.85 | 3.92 | 4.03 | 1.96 |
| 85 | 9.70 | 8.73 | 7.76 | 7.76 | 3.88 | 3.98 | 1.94 |
| 86 | 9.59 | 8.63 | 7.67 | 7.67 | 3.83 | 3.94 | 1.92 |
| 87 | 9.48 | 8.53 | 7.58 | 7.58 | 3.79 | 3.90 | 1.90 |
| 88 | 9.37 | 8.43 | 7.49 | 7.49 | 3.75 | 3.85 | 1.87 |
| 89 | 9.27 | 8.34 | 7.41 | 7.41 | 3.70 | 3.81 | 1.85 |
| 90 | 9.17 | 8.25 | 7.33 | 7.33 | 3.66 | 3.77 | 1.83 |
| 91 | 9.07 | 8.16 | 7.25 | | 3.62 | 3.73 | 1.81 |
| 92 | 8.97 | 8.06 | 7.17 | | 3.58 | 3.69 | 1.79 |
| 93 | 8.87 | 7.98 | 7.09 | | 3.54 | 3.65 | 1.77 |
| 94 | 8.78 | 7.90 | 7.02 | | 3.51 | 3.61 | 1.75 |
| | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears |
| | 36'' Frame 24-94 T | 36'' Frame 30-94 T | 36'' Frame 30-94 T | 36'' Frame 40-88 T | 36'' Frame 15-94 T | 36'' Frame 28-94 T | 36'' Frame 30-94 T |
| | 39'' Frame 15-70 T | 39'' Frame 15-86 T | 39'' Frame 15-86 T | 39'' Frame 24-90 T | 39'' Frame 15-94 T | 39'' Frame 15-94 T | 39'' Frame 15-94 T |
| Const's | 825.05 | 742.25 | 659.78 | 659.78 | 330.02 | 339.05 | 164.94 |

BAND DRIVE

Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter

Cylinder 8 inches Diameter. Ratio Cylinder to Whirl 1 to 9.52
 Whirl $\frac{1}{4}$ inch Diameter. Front Roll Gear 108 Teeth

| Change | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|---------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Gears | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 15 T | 100.05 | 98.15 | 87.24 | | 43.62 | 44.83 | 21.81 |
| 16 | 102.27 | 92.00 | 81.78 | | 40.90 | 42.03 | 20.45 |
| 17 | 96.25 | 86.59 | 76.97 | | 38.50 | 39.56 | 19.24 |
| 18 | 90.90 | 81.78 | 72.70 | | 36.16 | 37.36 | 18.17 |
| 19 | 86.12 | 77.48 | 68.87 | | 34.45 | 35.39 | 17.22 |
| 20 | 81.81 | 73.60 | 65.43 | | 32.72 | 33.62 | 16.36 |
| 21 | 76.92 | 70.10 | 62.31 | | 31.16 | 32.02 | 15.58 |
| 22 | 74.38 | 66.91 | 59.48 | | 29.75 | 30.56 | 14.87 |
| 23 | 71.14 | 64.00 | 56.89 | | 28.45 | 29.23 | 14.22 |
| 24 | 68.18 | 61.33 | 54.52 | 54.52 | 27.27 | 28.02 | 13.63 |
| 25 | 65.45 | 58.88 | 52.34 | 52.34 | 26.18 | 26.90 | 13.08 |
| 26 | 62.93 | 56.62 | 50.33 | 50.33 | 25.17 | 25.86 | 12.58 |
| 27 | 60.60 | 54.52 | 48.46 | 48.46 | 24.24 | 24.90 | 12.12 |
| 28 | 58.44 | 52.57 | 46.73 | 46.73 | 23.37 | 24.01 | 11.68 |
| 29 | 56.42 | 50.76 | 45.12 | 45.12 | 22.57 | 23.19 | 11.28 |
| 30 | 54.54 | 49.07 | 43.62 | 43.62 | 21.81 | 22.41 | 10.90 |
| 31 | 52.78 | 47.48 | 42.21 | 42.21 | 21.11 | 21.69 | 10.55 |
| 32 | 51.13 | 46.00 | 40.89 | 40.89 | 20.45 | 21.01 | 10.22 |
| 33 | 49.58 | 44.61 | 39.65 | 39.65 | 19.83 | 20.38 | 9.91 |
| 34 | 48.12 | 43.29 | 38.49 | 38.49 | 19.25 | 19.78 | 9.62 |
| 35 | 46.75 | 42.06 | 37.39 | 37.39 | 18.69 | 19.21 | 9.35 |
| 36 | 45.45 | 40.89 | 36.35 | 36.35 | 18.18 | 18.68 | 9.09 |
| 37 | 44.22 | 39.78 | 35.37 | 35.37 | 17.69 | 18.71 | 8.84 |
| 38 | 43.06 | 38.74 | 34.44 | 34.44 | 17.22 | 17.69 | 8.60 |
| 39 | 41.95 | 37.74 | 33.55 | 33.55 | 16.78 | 17.24 | 8.38 |
| 40 | 40.90 | 36.80 | 32.71 | 32.71 | 16.36 | 16.81 | 8.18 |
| 41 | 39.91 | 35.90 | 31.91 | 31.91 | 15.96 | 16.40 | 7.98 |
| 42 | 38.96 | 35.05 | 31.16 | 31.16 | 15.58 | 16.01 | 7.79 |
| 43 | 38.05 | 34.23 | 30.43 | 30.43 | 15.22 | 15.64 | 7.61 |
| 44 | 37.19 | 33.46 | 29.74 | 29.74 | 14.87 | 15.28 | 7.43 |
| 45 | 36.36 | 32.71 | 29.08 | 29.08 | 14.54 | 14.94 | 7.27 |
| 46 | 35.57 | 32.00 | 28.45 | 28.45 | 14.22 | 14.62 | 7.11 |
| 47 | 34.81 | 31.32 | 27.84 | 27.84 | 13.92 | 14.31 | 6.96 |
| 48 | 34.09 | 30.66 | 27.26 | 27.26 | 13.63 | 14.01 | 6.81 |
| 49 | 33.39 | 30.04 | 26.71 | 26.71 | 13.35 | 13.72 | 6.68 |
| 50 | 32.72 | 29.44 | 26.17 | 26.17 | 13.09 | 13.45 | 6.54 |
| 51 | 32.08 | 28.86 | 25.66 | 25.66 | 12.83 | 13.19 | 6.41 |
| 52 | 31.35 | 28.31 | 25.16 | 25.16 | 12.58 | 12.93 | 6.29 |
| 53 | 30.87 | 27.77 | 24.69 | 24.69 | 12.35 | 12.69 | 6.17 |
| 54 | 30.30 | 27.26 | 24.23 | 24.23 | 12.12 | 12.45 | 6.06 |
| 55 | 29.75 | 26.76 | 23.79 | 23.79 | 11.90 | 12.23 | 5.95 |
| 56 | 29.22 | 26.28 | 23.37 | 23.37 | 11.61 | 12.01 | 5.84 |
| 57 | 28.70 | 25.82 | 22.96 | 22.96 | 11.48 | 11.80 | 5.74 |
| 58 | 28.21 | 25.38 | 22.56 | 22.56 | 11.28 | 11.59 | 5.64 |
| Const's | 1636.36 | 1472.13 | 1308.56 | 1308.56 | 654.55 | 672.45 | 327.14 |

BAND DRIVE Spinning Twist Gear Table

FRONT ROLL 1 inch Diameter

Cylinder 8 inches diameter. Ratio Cylinder to Whirl 1 to 9.52

Whirl $\frac{3}{4}$ inch diameter. Front Roll gear 108 teeth

| Change Gears | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|-----------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 59T | 27.73 | 24.95 | 22.18 | 22.18 | 11.09 | 11.40 | 5.54 |
| 60 | 27.27 | 24.54 | 21.81 | 21.81 | 10.90 | 11.21 | 5.45 |
| 61 | 26.82 | 24.13 | 21.45 | 21.45 | 10.73 | 11.02 | 5.36 |
| 62 | 26.39 | 23.74 | 21.11 | 21.11 | 10.55 | 10.85 | 5.28 |
| 63 | 25.97 | 23.36 | 20.77 | 20.77 | 10.38 | 10.67 | 5.19 |
| 64 | 25.56 | 23.00 | 20.45 | 20.45 | 10.22 | 10.51 | 5.11 |
| 65 | 25.17 | 22.64 | 20.13 | 20.13 | 10.07 | 10.35 | 5.03 |
| 66 | 24.79 | 22.30 | 19.83 | 19.83 | 9.92 | 10.19 | 4.96 |
| 67 | 24.42 | 21.97 | 19.53 | 19.53 | 9.76 | 10.04 | 4.88 |
| 68 | 24.06 | 21.61 | 19.24 | 19.24 | 9.62 | 9.89 | 4.81 |
| 69 | 23.71 | 21.33 | 18.97 | 18.97 | 9.48 | 9.75 | 4.74 |
| 70 | 23.37 | 21.03 | 18.69 | 18.69 | 9.35 | 9.61 | 4.67 |
| 71 | 23.04 | 20.73 | 18.43 | 18.43 | 9.21 | 9.47 | 4.61 |
| 72 | 22.72 | 20.44 | 18.17 | 18.17 | 9.09 | 9.34 | 4.54 |
| 73 | 22.41 | 20.16 | 17.93 | 17.93 | 8.96 | 9.21 | 4.48 |
| 74 | 22.11 | 19.89 | 17.68 | 17.68 | 8.84 | 9.09 | 4.42 |
| 75 | 21.81 | 19.62 | 17.45 | 17.45 | 8.72 | 8.97 | 4.36 |
| 76 | 21.53 | 19.37 | 17.22 | 17.22 | 8.61 | 8.85 | 4.30 |
| 77 | 21.25 | 19.11 | 16.99 | 16.99 | 8.50 | 8.73 | 4.25 |
| 78 | 20.98 | 18.87 | 16.80 | 16.80 | 8.39 | 8.62 | 4.19 |
| 79 | 20.71 | 18.63 | 16.56 | 16.56 | 8.28 | 8.51 | 4.14 |
| 80 | 20.45 | 18.40 | 16.36 | 16.36 | 8.18 | 8.41 | 4.09 |
| 81 | 20.20 | 18.17 | 16.15 | 16.15 | 8.08 | 8.30 | 4.04 |
| 82 | 19.95 | 17.95 | 15.96 | 15.96 | 7.98 | 8.20 | 3.99 |
| 83 | 19.71 | 17.73 | 15.75 | 15.75 | 7.88 | 8.10 | 3.94 |
| 84 | 19.48 | 17.52 | 15.58 | 15.58 | 7.79 | 8.01 | 3.89 |
| 85 | 19.25 | 17.31 | 15.39 | 15.39 | 7.70 | 7.91 | 3.85 |
| 86 | 19.02 | 17.11 | 15.22 | 15.22 | 7.61 | 7.82 | 3.80 |
| 87 | 18.80 | 16.92 | 15.04 | 15.04 | 7.52 | 7.73 | 3.76 |
| 88 | 18.59 | 16.72 | 14.87 | 14.87 | 7.43 | 7.64 | 3.72 |
| 89 | 18.38 | 16.54 | 14.70 | 14.70 | 7.35 | 7.56 | 3.68 |
| 90 | 18.18 | 16.35 | 14.54 | 14.54 | 7.27 | 7.47 | 3.63 |
| 91 | 17.98 | 16.17 | 14.38 | | 7.19 | 7.39 | 3.59 |
| 92 | 17.78 | 16.00 | 14.22 | | 7.11 | 7.31 | 3.56 |
| 93 | 17.59 | 15.83 | 14.07 | | 7.03 | 7.23 | 3.52 |
| 94 | 17.40 | 15.66 | 13.92 | | 6.96 | 7.15 | 3.48 |
| Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears |
| 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame |
| 24-94 T | 30-94 T | 30-94 T | 40-88 T | 15-94 T | 28-94 T | 30-94 T | |
| 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | |
| 15-70 T | 15-86 T | 15-86 T | 24-90 T | 15-94 T | | 15-94 T | |
| Const's | 1336.36 | 1472.13 | 1308.56 | 1308.56 | 654.55 | 672.45 | 327.14 |

BAND DRIVE

Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter.

Cylinder 8 inch Diameter.

Ratio Cylinder to Whirl 1 to 8.91.

Whirl $\frac{13}{16}$ inch Diameter.

Front Roll Gear 108 Teeth.

| Change | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|---------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Gears | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 15 T | 102.05 | 91.85 | 81.65 | | 40.82 | 41.96 | 20.41 |
| 16 | 95.70 | 86.11 | 76.55 | | 38.28 | 39.93 | 19.13 |
| 17 | 90.07 | 81.04 | 72.04 | | 36.03 | 37.02 | 18.01 |
| 18 | 85.07 | 76.54 | 68.04 | | 34.03 | 34.96 | 17.01 |
| 19 | 80.59 | 72.51 | 64.46 | | 32.24 | 33.12 | 16.11 |
| 20 | 76.56 | 68.89 | 61.24 | | 30.63 | 31.46 | 15.31 |
| 21 | 72.92 | 65.61 | 58.31 | | 29.17 | 29.97 | 14.58 |
| 22 | 69.60 | 62.62 | 55.67 | | 27.84 | 28.61 | 13.92 |
| 23 | 66.57 | 59.90 | 53.25 | | 26.63 | 27.36 | 13.31 |
| 24 | 63.80 | 57.40 | 51.03 | 51.03 | 25.52 | 26.22 | 12.76 |
| 25 | 61.25 | 55.11 | 48.99 | 48.99 | 24.50 | 25.17 | 12.25 |
| 26 | 58.88 | 52.99 | 47.10 | 47.10 | 23.56 | 24.21 | 11.77 |
| 27 | 56.71 | 51.03 | 45.36 | 45.36 | 22.68 | 23.31 | 11.34 |
| 28 | 54.69 | 49.20 | 43.74 | 43.74 | 21.87 | 22.48 | 10.93 |
| 29 | 52.80 | 47.51 | 42.23 | 42.23 | 21.12 | 21.70 | 10.55 |
| 30 | 51.04 | 45.92 | 40.82 | 40.82 | 20.42 | 20.98 | 10.21 |
| 31 | 49.39 | 44.44 | 39.51 | 39.51 | 19.76 | 20.30 | 9.88 |
| 32 | 47.85 | 43.05 | 38.28 | 38.28 | 19.14 | 19.67 | 9.57 |
| 33 | 46.40 | 41.75 | 37.12 | 37.12 | 18.56 | 19.07 | 9.28 |
| 34 | 45.03 | 40.52 | 36.02 | 36.02 | 18.01 | 18.51 | 9.01 |
| 35 | 43.75 | 39.36 | 35.14 | 35.14 | 17.50 | 17.98 | 8.75 |
| 36 | 42.53 | 38.21 | 34.02 | 34.02 | 17.01 | 17.48 | 8.51 |
| 37 | 41.38 | 37.23 | 33.10 | 33.10 | 16.55 | 17.01 | 8.27 |
| 38 | 40.29 | 36.25 | 32.23 | 32.23 | 16.12 | 16.55 | 8.05 |
| 39 | 39.26 | 35.32 | 31.40 | 31.40 | 15.70 | 16.13 | 7.85 |
| 40 | 38.28 | 34.44 | 30.62 | 30.62 | 15.31 | 15.73 | 7.65 |
| 41 | 37.34 | 33.60 | 29.88 | 29.88 | 14.94 | 15.35 | 7.47 |
| 42 | 36.46 | 32.80 | 29.16 | 29.16 | 14.58 | 14.98 | 7.29 |
| 43 | 35.61 | 32.04 | 28.48 | 28.48 | 14.24 | 14.64 | 7.12 |
| 44 | 34.80 | 31.31 | 27.84 | 27.84 | 13.92 | 14.30 | 6.96 |
| 45 | 34.03 | 30.61 | 27.21 | 27.21 | 13.61 | 13.98 | 6.80 |
| 46 | 33.28 | 29.95 | 26.62 | 26.62 | 13.31 | 13.68 | 6.65 |
| 47 | 32.58 | 29.31 | 26.06 | 26.06 | 13.03 | 13.39 | 6.51 |
| 48 | 31.90 | 28.70 | 25.52 | 25.52 | 12.76 | 13.11 | 6.38 |
| 49 | 31.25 | 28.11 | 24.99 | 24.99 | 12.50 | 12.84 | 6.25 |
| 50 | 30.62 | 27.55 | 24.49 | 24.49 | 12.25 | 12.59 | 6.12 |
| 51 | 30.02 | 27.01 | 24.01 | 24.01 | 12.01 | 12.34 | 6.00 |
| 52 | 29.44 | 26.49 | 23.56 | 23.56 | 11.78 | 12.10 | 5.89 |
| 53 | 28.88 | 25.99 | 23.11 | 23.11 | 11.55 | 11.88 | 5.78 |
| 54 | 28.35 | 25.51 | 22.68 | 22.68 | 11.34 | 11.66 | 5.67 |
| 55 | 27.84 | 25.05 | 22.27 | 22.27 | 11.17 | 11.45 | 5.57 |
| 56 | 27.34 | 24.60 | 21.87 | 21.87 | 10.93 | 11.24 | 5.46 |
| 57 | 26.86 | 24.17 | 21.49 | 21.49 | 10.74 | 11.04 | 5.37 |
| 58 | 26.40 | 23.75 | 21.12 | 21.12 | 10.56 | 10.85 | 5.28 |
| Const's | 1531.32 | 1377.81 | 1224.72 | 1224.72 | 612.61 | 629.37 | 306.18 |

BAND DRIVE

Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter.

Cylinder 8 inch Diameter. Ratio Cylinder to Whirl 1 to 8.91.

Whirl $\frac{13}{16}$ inch Diameter. Front Roll Gear 108 Teeth.

| Change Gears | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|-----------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 59T | 25.95 | 23.30 | 20.76 | 20.76 | 10.38 | 10.67 | 5.19 |
| 60 | 25.52 | 22.96 | 20.41 | 20.41 | 10.21 | 10.49 | 5.10 |
| 61 | 25.10 | 22.59 | 20.08 | 20.08 | 10.04 | 10.32 | 5.02 |
| 62 | 24.69 | 22.22 | 19.75 | 19.75 | 9.88 | 10.15 | 4.94 |
| 63 | 24.30 | 21.87 | 19.44 | 19.44 | 9.72 | 9.99 | 4.86 |
| 64 | 23.92 | 21.52 | 19.14 | 19.14 | 9.57 | 9.83 | 4.78 |
| 65 | 23.55 | 21.19 | 18.84 | 18.84 | 9.42 | 9.68 | 4.71 |
| 66 | 23.20 | 20.87 | 18.56 | 18.56 | 9.28 | 9.54 | 4.64 |
| 67 | 22.85 | 20.56 | 18.28 | 18.28 | 9.14 | 9.39 | 4.57 |
| 68 | 22.51 | 20.26 | 18.01 | 18.01 | 9.00 | 9.25 | 4.50 |
| 69 | 22.19 | 19.96 | 17.75 | 17.75 | 8.87 | 9.12 | 4.44 |
| 70 | 21.87 | 19.68 | 17.50 | 17.50 | 8.75 | 8.99 | 4.37 |
| 71 | 21.56 | 19.40 | 17.25 | 17.25 | 8.62 | 8.86 | 4.31 |
| 72 | 21.26 | 19.13 | 17.01 | 17.01 | 8.50 | 8.74 | 4.25 |
| 73 | 20.97 | 18.87 | 16.78 | 16.78 | 8.39 | 8.62 | 4.19 |
| 74 | 20.69 | 18.61 | 16.55 | 16.55 | 8.27 | 8.51 | 4.14 |
| 75 | 20.41 | 18.37 | 16.33 | 16.33 | 8.16 | 8.39 | 4.08 |
| 76 | 20.14 | 18.12 | 16.11 | 16.11 | 8.06 | 8.28 | 4.03 |
| 77 | 19.88 | 17.89 | 15.91 | 15.91 | 7.95 | 8.17 | 3.98 |
| 78 | 19.63 | 17.66 | 15.70 | 15.70 | 7.85 | 8.07 | 3.93 |
| 79 | 19.38 | 17.44 | 15.50 | 15.50 | 7.75 | 7.97 | 3.88 |
| 80 | 19.14 | 17.22 | 15.31 | 15.31 | 7.65 | 7.87 | 3.83 |
| 81 | 18.90 | 17.01 | 15.12 | 15.12 | 7.56 | 7.77 | 3.78 |
| 82 | 18.67 | 16.80 | 14.94 | 14.94 | 7.47 | 7.68 | 3.73 |
| 83 | 18.44 | 16.60 | 14.75 | 14.75 | 7.38 | 7.58 | 3.69 |
| 84 | 18.23 | 16.40 | 14.58 | 14.58 | 7.29 | 7.49 | 3.65 |
| 85 | 18.01 | 16.20 | 14.41 | 14.41 | 7.20 | 7.40 | 3.60 |
| 86 | 17.80 | 16.02 | 14.24 | 14.24 | 7.12 | 7.32 | 3.56 |
| 87 | 17.60 | 15.82 | 14.08 | 14.08 | 7.04 | 7.23 | 3.52 |
| 88 | 17.40 | 15.65 | 13.92 | 13.92 | 6.96 | 7.15 | 3.48 |
| 89 | 17.20 | 15.48 | 13.76 | 13.76 | 6.88 | 7.07 | 3.44 |
| 90 | 17.01 | 15.30 | 13.61 | 13.61 | 6.80 | 6.99 | 3.40 |
| 91 | 16.82 | 15.14 | 13.46 | | 6.73 | 6.92 | 3.36 |
| 92 | 16.64 | 14.97 | 13.31 | | 6.65 | 6.84 | 3.33 |
| 93 | 16.46 | 14.81 | 13.17 | | 6.58 | 6.77 | 3.29 |
| 94 | 16.29 | 14.65 | 13.03 | | 6.51 | 6.70 | 3.26 |
| Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears |
| 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame |
| 24-94 T | 30-94 T | 30-94 T | 40-88 T | 15-94 T | 28-94 T | 30-94 T | |
| 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame |
| 15-70 T | 15-86 T | 15-86 T | 24-90 T | 15-94 T | 15-94 T | 15-94 T | |
| Const's | 1531.32 | 1377.81 | 1224.72 | 1224.72 | 612.61 | 629.37 | 306.18 |

BAND DRIVE Spinning Twist Gear Table.

FRONT ROLL 1 Inch Diameter.

Cylinder 8 inches Diameter. Ratio Cylinder to Whirl 1 to 8.28
Whirl $\frac{7}{8}$ inch Diameter. Front Roll Gear 108 Teeth

| Change | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|---------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Gears | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 15T | 94.85 | 85.37 | 75.87 | | 37.94 | 38.99 | 18.97 |
| 16 | 88.95 | 80.02 | 71.13 | | 35.58 | 36.55 | 17.78 |
| 17 | 83.71 | 75.31 | 66.95 | | 33.48 | 34.40 | 16.74 |
| 18 | 79.06 | 71.13 | 63.23 | | 31.62 | 32.49 | 15.81 |
| 19 | 74.90 | 67.38 | 59.90 | | 29.96 | 30.78 | 14.97 |
| 20 | 71.16 | 64.01 | 56.91 | | 28.46 | 29.24 | 14.22 |
| 21 | 67.77 | 60.97 | 54.20 | | 27.10 | 27.85 | 13.55 |
| 22 | 64.69 | 58.19 | 51.73 | | 25.87 | 26.58 | 12.93 |
| 23 | 61.87 | 55.66 | 49.48 | | 24.75 | 25.42 | 12.37 |
| 24 | 59.30 | 53.34 | 47.42 | 47.42 | 23.72 | 24.37 | 11.86 |
| 25 | 56.92 | 51.21 | 45.52 | 45.52 | 22.77 | 23.39 | 11.38 |
| 26 | 54.73 | 49.24 | 43.77 | 43.77 | 21.89 | 22.49 | 10.94 |
| 27 | 52.71 | 47.42 | 42.15 | 42.15 | 21.08 | 21.66 | 10.54 |
| 28 | 50.82 | 45.72 | 40.65 | 40.65 | 20.33 | 20.89 | 10.16 |
| 29 | 48.04 | 44.15 | 39.24 | 39.24 | 19.63 | 20.17 | 9.81 |
| 30 | 47.44 | 42.67 | 37.94 | 37.94 | 18.97 | 19.49 | 9.48 |
| 31 | 45.91 | 41.30 | 36.71 | 36.71 | 18.36 | 18.87 | 9.18 |
| 32 | 44.47 | 40.01 | 35.57 | 35.57 | 17.79 | 18.28 | 8.89 |
| 33 | 43.12 | 38.79 | 34.49 | 34.49 | 17.25 | 17.72 | 8.62 |
| 34 | 41.85 | 37.65 | 33.47 | 33.47 | 16.74 | 17.20 | 8.37 |
| 35 | 40.66 | 36.58 | 32.52 | 32.52 | 16.26 | 16.71 | 8.13 |
| 36 | 39.53 | 35.56 | 31.61 | 31.61 | 15.81 | 16.24 | 7.90 |
| 37 | 38.46 | 34.60 | 30.76 | 30.76 | 15.38 | 15.81 | 7.69 |
| 38 | 37.45 | 33.69 | 29.95 | 29.95 | 14.98 | 15.39 | 7.49 |
| 39 | 36.49 | 32.83 | 29.18 | 29.18 | 14.59 | 15.00 | 7.29 |
| 40 | 35.58 | 32.00 | 28.45 | 28.48 | 14.23 | 14.62 | 7.11 |
| 41 | 34.71 | 31.22 | 27.76 | 27.76 | 13.88 | 14.26 | 6.94 |
| 42 | 33.88 | 30.48 | 27.10 | 27.10 | 13.55 | 13.92 | 6.77 |
| 43 | 33.09 | 29.77 | 26.47 | 26.47 | 13.23 | 13.60 | 6.62 |
| 44 | 32.36 | 29.10 | 25.87 | 25.87 | 12.93 | 13.29 | 6.47 |
| 45 | 31.62 | 28.45 | 25.29 | 25.29 | 12.65 | 13.00 | 6.32 |
| 46 | 30.93 | 27.83 | 24.74 | 24.74 | 12.37 | 12.71 | 6.18 |
| 47 | 30.28 | 27.24 | 24.21 | 24.21 | 12.11 | 12.44 | 6.05 |
| 48 | 29.65 | 26.67 | 23.71 | 23.71 | 11.86 | 12.18 | 5.93 |
| 49 | 29.04 | 26.10 | 23.23 | 23.23 | 11.61 | 11.94 | 5.81 |
| 50 | 28.46 | 25.60 | 22.76 | 22.76 | 11.38 | 11.70 | 5.69 |
| 51 | 27.90 | 25.10 | 22.32 | 22.32 | 11.16 | 11.47 | 5.58 |
| 52 | 27.36 | 24.62 | 21.89 | 21.89 | 10.94 | 11.25 | 5.47 |
| 53 | 26.85 | 24.15 | 21.49 | 21.49 | 10.74 | 11.04 | 5.37 |
| 54 | 26.35 | 23.71 | 21.08 | 21.08 | 10.54 | 10.83 | 5.27 |
| 55 | 25.87 | 23.27 | 20.69 | 20.69 | 10.35 | 10.63 | 5.17 |
| 56 | 25.41 | 22.86 | 20.32 | 20.32 | 10.16 | 10.44 | 5.08 |
| 57 | 24.96 | 22.46 | 19.97 | 19.97 | 9.98 | 10.26 | 4.99 |
| 58 | 24.53 | 22.07 | 19.62 | 19.62 | 9.81 | 10.08 | 4.91 |
| Const's | 1423.22 | 1280.38 | 1138.12 | 1138.12 | 569.28 | 584.86 | 284.53 |

BAND DRIVE

Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter.

Cylinder 8 inch Diameter. Ratio Cylinder to Whirl 1 to 8.28.
Whirl $\frac{7}{8}$ inch Diameter. Front Roll Gear 108 Teeth

| Change Gears | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|-----------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 59T | 24.12 | 21.70 | 19.29 | 19.29 | 9.64 | 9.91 | 4.82 |
| 60 | 23.72 | 21.33 | 18.97 | 18.97 | 9.48 | 9.75 | 4.74 |
| 61 | 23.33 | 20.98 | 18.66 | 18.66 | 9.33 | 9.59 | 4.66 |
| 62 | 22.95 | 20.65 | 18.36 | 18.36 | 9.18 | 9.43 | 4.59 |
| 63 | 22.59 | 20.32 | 18.07 | 18.07 | 9.03 | 9.28 | 4.52 |
| 64 | 22.23 | 20.00 | 17.78 | 17.78 | 8.89 | 9.14 | 4.45 |
| 65 | 21.89 | 19.69 | 17.51 | 17.51 | 8.75 | 9.00 | 4.38 |
| 66 | 21.56 | 19.39 | 17.24 | 17.24 | 8.62 | 8.86 | 4.31 |
| 67 | 21.24 | 19.11 | 16.99 | 16.99 | 8.49 | 8.73 | 4.25 |
| 68 | 20.92 | 18.83 | 16.74 | 16.74 | 8.37 | 8.60 | 4.18 |
| 69 | 20.62 | 18.55 | 16.49 | 16.49 | 8.25 | 8.48 | 4.12 |
| 70 | 20.33 | 18.29 | 16.26 | 16.26 | 8.13 | 8.36 | 4.06 |
| 71 | 20.04 | 18.03 | 16.03 | 16.03 | 8.01 | 8.24 | 4.01 |
| 72 | 19.76 | 17.78 | 15.81 | 15.81 | 7.90 | 8.12 | 3.95 |
| 73 | 19.49 | 17.53 | 15.59 | 15.59 | 7.79 | 8.01 | 3.90 |
| 74 | 19.23 | 17.30 | 15.38 | 15.38 | 7.69 | 7.90 | 3.84 |
| 75 | 18.97 | 17.07 | 15.17 | 15.17 | 7.59 | 7.80 | 3.79 |
| 76 | 18.72 | 16.84 | 14.98 | 14.98 | 7.49 | 7.70 | 3.74 |
| 77 | 18.48 | 16.62 | 14.78 | 14.78 | 7.39 | 7.60 | 3.70 |
| 78 | 18.24 | 16.41 | 14.59 | 14.59 | 7.29 | 7.50 | 3.65 |
| 79 | 18.01 | 16.20 | 14.41 | 14.41 | 7.20 | 7.40 | 3.60 |
| 80 | 17.79 | 16.00 | 14.23 | 14.23 | 7.11 | 7.31 | 3.56 |
| 81 | 17.57 | 15.80 | 14.05 | 14.05 | 7.02 | 7.22 | 3.51 |
| 82 | 17.35 | 15.61 | 13.88 | 13.88 | 6.94 | 7.13 | 3.47 |
| 83 | 17.14 | 15.42 | 13.71 | 13.71 | 6.85 | 7.05 | 3.43 |
| 84 | 16.94 | 15.24 | 13.55 | 13.55 | 6.77 | 6.96 | 3.39 |
| 85 | 16.74 | 15.06 | 13.39 | 13.39 | 6.69 | 6.88 | 3.35 |
| 86 | 16.54 | 14.88 | 13.23 | 13.23 | 6.61 | 6.80 | 3.31 |
| 87 | 16.35 | 14.71 | 13.08 | 13.08 | 6.54 | 6.72 | 3.27 |
| 88 | 16.17 | 14.54 | 12.93 | 12.93 | 6.46 | 6.65 | 3.23 |
| 89 | 15.99 | 14.38 | 12.79 | 12.79 | 6.39 | 6.57 | 3.20 |
| 90 | 15.81 | 14.22 | 12.65 | 12.65 | 6.32 | 6.50 | 3.16 |
| 91 | 15.53 | 14.07 | 12.51 | | 6.25 | 6.43 | 3.13 |
| 92 | 15.46 | 13.91 | 12.37 | | 6.18 | 6.36 | 3.09 |
| 93 | 15.30 | 13.76 | 12.24 | | 6.12 | 6.29 | 3.06 |
| 94 | 15.14 | 13.62 | 12.11 | | 6.05 | 6.22 | 3.03 |
| Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears |
| 36" Frame | 36" Frame | 36" Frame | 36" Frame | 36" Frame | 36" Frame | 36" Frame | 36" Frame |
| 24-94 T | 30-94 T | 30-94 T | 40-88 T | 15-94 T | 28-94 T | 30-94 T | |
| 39" Frame | 39" Frame | 39" Frame | 39" Frame | 39" Frame | 39" Frame | 39" Frame | |
| 15-70 T | 15-86 T | 15-86 T | 24-90 T | 15-94 T | 15-94 T | 15-94 T | |
| Const's | 1423.22 | 1280.38 | 1138.12 | 1138.12 | 569.28 | 584.86 | 284.53 |

BAND DRIVE

Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter.

Cylinder 8 inch Diameter.

Ratio Cylinder to Whirl 1 to 7.67.

Whirl $\frac{15}{16}$ inch Diameter.

Front Roll Gear 108 Teeth.

| Change Gears | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|--------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 15T | 87.85 | 79.06 | 70.28 | | 35.14 | 36.12 | 17.57 |
| 16 | 82.39 | 74.12 | 65.89 | | 32.95 | 33.86 | 16.48 |
| 17 | 77.55 | 69.76 | 62.02 | | 31.02 | 31.87 | 15.50 |
| 18 | 73.24 | 65.89 | 58.57 | | 29.29 | 30.10 | 14.64 |
| 19 | 69.38 | 62.42 | 55.49 | | 27.75 | 28.52 | 13.87 |
| 20 | 65.91 | 59.30 | 52.78 | | 26.36 | 27.12 | 13.20 |
| 21 | 62.77 | 56.47 | 50.27 | | 25.11 | 25.83 | 12.57 |
| 22 | 59.92 | 53.91 | 47.98 | | 23.96 | 24.66 | 12.00 |
| 23 | 57.32 | 51.56 | 45.89 | | 22.92 | 23.59 | 11.50 |
| 24 | 54.93 | 49.41 | 43.98 | 43.98 | 21.97 | 22.60 | 11.00 |
| 25 | 52.73 | 47.44 | 42.23 | 42.23 | 21.09 | 21.70 | 10.56 |
| 26 | 50.70 | 45.62 | 40.60 | 40.60 | 20.28 | 20.86 | 10.15 |
| 27 | 48.82 | 43.92 | 39.10 | 39.10 | 19.53 | 20.09 | 9.77 |
| 28 | 47.08 | 42.35 | 37.70 | 37.70 | 18.83 | 19.37 | 9.43 |
| 29 | 45.46 | 40.89 | 36.40 | 36.40 | 18.17 | 18.71 | 9.10 |
| 30 | 43.94 | 39.53 | 35.19 | 35.19 | 17.57 | 18.08 | 8.80 |
| 31 | 42.52 | 38.26 | 34.05 | 34.05 | 17.01 | 17.50 | 8.52 |
| 32 | 41.19 | 37.06 | 32.99 | 32.99 | 16.47 | 16.95 | 8.25 |
| 33 | 39.95 | 35.94 | 31.99 | 31.99 | 15.98 | 16.44 | 8.00 |
| 34 | 38.77 | 34.88 | 31.04 | 31.04 | 15.51 | 15.95 | 7.76 |
| 35 | 37.66 | 33.88 | 30.16 | 30.16 | 15.09 | 15.51 | 7.54 |
| 36 | 36.62 | 32.94 | 29.32 | 29.32 | 14.64 | 15.06 | 7.33 |
| 37 | 35.63 | 32.05 | 28.53 | 28.53 | 14.25 | 14.66 | 7.13 |
| 38 | 34.69 | 31.21 | 27.78 | 27.78 | 13.87 | 14.28 | 6.95 |
| 39 | 33.80 | 30.41 | 27.07 | 27.07 | 13.52 | 13.91 | 6.77 |
| 40 | 32.95 | 29.65 | 26.39 | 26.39 | 13.18 | 13.56 | 6.60 |
| 41 | 32.15 | 28.92 | 25.75 | 25.75 | 12.86 | 13.23 | 6.44 |
| 42 | 31.33 | 28.23 | 25.13 | 25.13 | 12.55 | 12.91 | 6.28 |
| 43 | 30.65 | 27.58 | 24.55 | 24.55 | 12.26 | 12.61 | 6.14 |
| 44 | 29.96 | 27.86 | 23.99 | 23.99 | 11.98 | 12.33 | 6.00 |
| 45 | 29.29 | 26.35 | 23.46 | 23.46 | 11.71 | 12.05 | 5.87 |
| 46 | 28.66 | 25.78 | 22.95 | 22.95 | 11.46 | 11.79 | 5.74 |
| 47 | 28.05 | 25.23 | 22.46 | 22.46 | 11.21 | 11.54 | 5.62 |
| 48 | 27.46 | 24.70 | 21.99 | 21.99 | 10.98 | 11.30 | 5.50 |
| 49 | 26.90 | 24.20 | 21.52 | 21.52 | 10.76 | 11.06 | 5.38 |
| 50 | 26.36 | 23.72 | 21.11 | 21.11 | 10.54 | 10.85 | 5.28 |
| 51 | 25.85 | 23.25 | 20.67 | 20.67 | 10.34 | 10.62 | 5.17 |
| 52 | 25.35 | 22.80 | 20.30 | 20.30 | 10.14 | 10.43 | 5.08 |
| 53 | 24.87 | 22.37 | 19.89 | 19.89 | 9.95 | 10.22 | 4.97 |
| 54 | 24.41 | 21.96 | 19.55 | 19.55 | 9.76 | 10.04 | 4.89 |
| 55 | 23.97 | 21.56 | 19.17 | 19.17 | 9.58 | 9.85 | 4.79 |
| 56 | 23.54 | 21.17 | 18.85 | 18.85 | 9.41 | 9.68 | 4.72 |
| 57 | 23.12 | 20.80 | 18.50 | 18.50 | 9.25 | 9.50 | 4.62 |
| 58 | 22.73 | 20.44 | 18.20 | 18.20 | 9.09 | 9.35 | 4.55 |
| Const's | 1318.37 | 1186.06 | 1054.27 | 1054.27 | 527.35 | 541.78 | 263.56 |

BAND DRIVE

Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter

Cylinder 8 inches Diameter. Ratio Cylinder to Whirl 1 to 7.67

Whirl $\frac{1}{8}$ inch Diameter Front Roll Gear 108 Teeth

| Change | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Gears | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 59T | 22.34 | 20.10 | 17.87 | 17.87 | 8.93 | 9.18 | 4.47 |
| 60 | 21.97 | 19.76 | 17.59 | 17.59 | 8.78 | 9.04 | 4.40 |
| 61 | 21.61 | 19.44 | 17.28 | 17.28 | 8.64 | 8.88 | 4.32 |
| 62 | 21.26 | 19.13 | 17.03 | 17.03 | 8.50 | 8.75 | 4.26 |
| 63 | 20.92 | 18.82 | 16.73 | 16.73 | 8.37 | 8.60 | 4.18 |
| 64 | 20.59 | 18.53 | 16.47 | 16.47 | 8.23 | 8.47 | 4.12 |
| 65 | 20.28 | 18.24 | 16.22 | 16.22 | 8.11 | 8.34 | 4.06 |
| 66 | 19.97 | 17.97 | 15.99 | 15.99 | 7.99 | 8.22 | 4.00 |
| 67 | 19.67 | 17.70 | 15.74 | 15.74 | 7.87 | 8.09 | 3.93 |
| 68 | 19.38 | 17.44 | 15.50 | 15.50 | 7.75 | 7.97 | 3.88 |
| 69 | 19.10 | 17.18 | 15.27 | 15.27 | 7.64 | 7.85 | 3.82 |
| 70 | 18.83 | 16.94 | 15.08 | 15.08 | 7.53 | 7.75 | 3.77 |
| 71 | 18.56 | 16.70 | 14.85 | 14.85 | 7.42 | 7.63 | 3.71 |
| 72 | 18.31 | 16.47 | 14.64 | 14.64 | 7.32 | 7.52 | 3.66 |
| 73 | 18.05 | 16.24 | 14.46 | 14.46 | 7.22 | 7.42 | 3.61 |
| 74 | 17.81 | 16.02 | 14.26 | 14.26 | 7.12 | 7.32 | 3.57 |
| 75 | 17.57 | 15.81 | 14.06 | 14.06 | 7.03 | 7.22 | 3.51 |
| 76 | 17.34 | 15.60 | 13.87 | 13.87 | 6.93 | 7.13 | 3.47 |
| 77 | 17.12 | 15.40 | 13.69 | 13.69 | 6.84 | 7.04 | 3.42 |
| 78 | 16.90 | 15.20 | 13.53 | 13.53 | 6.76 | 6.95 | 3.38 |
| 79 | 16.68 | 15.01 | 13.35 | 13.35 | 6.65 | 6.86 | 3.34 |
| 80 | 16.47 | 14.82 | 13.18 | 13.18 | 6.56 | 6.77 | 3.29 |
| 81 | 16.27 | 14.64 | 13.02 | 13.02 | 6.48 | 6.69 | 3.25 |
| 82 | 16.07 | 14.46 | 12.87 | 12.87 | 6.40 | 6.62 | 3.20 |
| 83 | 15.88 | 14.38 | 12.70 | 12.70 | 6.32 | 6.53 | 3.16 |
| 84 | 15.69 | 14.11 | 12.55 | 12.55 | 6.27 | 6.45 | 3.14 |
| 85 | 15.51 | 13.95 | 12.40 | 12.40 | 6.20 | 6.37 | 3.10 |
| 86 | 15.32 | 13.79 | 12.27 | 12.27 | 6.13 | 6.31 | 3.07 |
| 87 | 15.15 | 13.63 | 12.12 | 12.12 | 6.06 | 6.23 | 3.03 |
| 88 | 14.98 | 13.47 | 11.98 | 11.98 | 5.99 | 6.16 | 3.00 |
| 89 | 14.81 | 13.32 | 11.85 | 11.85 | 5.92 | 6.09 | 2.96 |
| 90 | 14.64 | 13.17 | 11.71 | 11.71 | 5.85 | 6.03 | 2.93 |
| 91 | 14.48 | 13.03 | 11.58 | | 5.79 | 5.95 | 2.89 |
| 92 | 14.33 | 12.89 | 11.47 | | 5.73 | 5.89 | 2.87 |
| 93 | 14.17 | 12.75 | 11.34 | | 5.66 | 5.83 | 2.82 |
| 94 | 14.02 | 12.61 | 11.22 | | 5.61 | 5.76 | 2.79 |
| Change | Change | Change | Change | Change | Change | Change | Change |
| Gears | Gears | Gears | Gears | Gears | Gears | Gears | Gears |
| 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame |
| 24-94 T | 30-94 T | 30-94 T | 40-88 T | 15-94 T | 28-94 T | 30-94 T | |
| 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | |
| 15-70 T | 15-86 T | 15-86 T | 24-90 T | 15-94 T | 15-94 T | 15-94 T | |
| Const's | 1318.37 | 1186.06 | 1054.27 | 1054.27 | 527.35 | 541.78 | 263.56 |

BAND DRIVE

Spinning Twist Gear Table.

FRONT ROLL 1 Inch Diameter.

Cylinder 8 inches Diameter. Ratio Cylinder to Whirl 1 to 7.08
 Whirl 1 inch Diameter. Front Roll Gear 108 Teeth

| Change Gears | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|-----------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 15 T | 81.10 | 72.99 | 64.88 | | 32.45 | 33.24 | 16.22 |
| 16 | 76.05 | 68.42 | 60.82 | | 30.42 | 31.26 | 15.21 |
| 17 | 71.58 | 64.40 | 57.25 | | 28.63 | 29.42 | 14.31 |
| 18 | 67.60 | 60.82 | 54.07 | | 27.04 | 27.78 | 13.52 |
| 19 | 64.05 | 57.62 | 51.22 | | 25.62 | 26.32 | 12.80 |
| 20 | 60.84 | 54.74 | 48.66 | | 24.33 | 25.05 | 12.16 |
| 21 | 57.95 | 52.13 | 46.34 | | 23.18 | 23.81 | 11.59 |
| 22 | 55.31 | 49.76 | 44.23 | | 22.12 | 22.73 | 11.06 |
| 23 | 52.91 | 47.60 | 42.31 | | 21.16 | 21.74 | 10.58 |
| 24 | 50.70 | 45.61 | 40.55 | 40.55 | 20.28 | 20.84 | 10.14 |
| 25 | 48.67 | 43.79 | 38.93 | 38.93 | 19.47 | 20.00 | 9.73 |
| 26 | 46.80 | 42.10 | 37.43 | 37.43 | 18.72 | 19.23 | 9.36 |
| 27 | 45.07 | 40.54 | 36.04 | 36.04 | 18.02 | 18.52 | 9.01 |
| 28 | 43.46 | 39.10 | 34.76 | 34.76 | 17.38 | 17.86 | 8.69 |
| 29 | 41.96 | 37.75 | 33.56 | 33.56 | 16.78 | 17.24 | 8.39 |
| 30 | 40.56 | 36.49 | 32.44 | 32.44 | 16.22 | 16.67 | 8.11 |
| 31 | 39.25 | 35.31 | 31.39 | 31.39 | 15.70 | 16.13 | 7.85 |
| 32 | 38.02 | 34.21 | 30.41 | 30.41 | 15.21 | 15.63 | 7.60 |
| 33 | 36.87 | 33.17 | 29.49 | 29.49 | 14.75 | 15.15 | 7.37 |
| 34 | 35.79 | 32.20 | 28.62 | 28.62 | 14.31 | 14.71 | 7.16 |
| 35 | 34.77 | 31.28 | 27.80 | 27.80 | 13.90 | 14.29 | 6.95 |
| 36 | 33.80 | 30.41 | 27.03 | 27.03 | 13.52 | 13.89 | 6.76 |
| 37 | 32.89 | 29.58 | 26.30 | 26.30 | 13.15 | 13.52 | 6.58 |
| 38 | 32.02 | 28.81 | 25.61 | 25.61 | 12.81 | 13.16 | 6.40 |
| 39 | 31.20 | 28.07 | 24.95 | 24.95 | 12.48 | 12.82 | 6.24 |
| 40 | 30.42 | 27.37 | 24.33 | 24.33 | 12.16 | 12.50 | 6.08 |
| 41 | 29.68 | 26.70 | 23.74 | 23.74 | 11.87 | 12.20 | 5.93 |
| 42 | 28.97 | 26.06 | 23.17 | 23.17 | 11.59 | 11.90 | 5.79 |
| 43 | 28.30 | 25.46 | 22.63 | 22.63 | 11.32 | 11.63 | 5.66 |
| 44 | 27.15 | 24.88 | 22.12 | 22.12 | 11.06 | 11.37 | 5.53 |
| 45 | 27.04 | 24.33 | 21.63 | 21.63 | 10.81 | 11.11 | 5.41 |
| 46 | 26.45 | 23.80 | 21.16 | 21.16 | 10.58 | 10.87 | 5.29 |
| 47 | 25.89 | 23.29 | 20.71 | 20.71 | 10.35 | 10.64 | 5.18 |
| 48 | 25.35 | 22.80 | 20.27 | 20.27 | 10.14 | 10.42 | 5.07 |
| 49 | 24.83 | 22.34 | 19.86 | 19.86 | 9.93 | 10.22 | 4.97 |
| 50 | 24.33 | 21.89 | 19.46 | 19.46 | 9.73 | 10.00 | 4.87 |
| 51 | 23.86 | 21.46 | 19.08 | 19.08 | 9.54 | 9.81 | 4.77 |
| 52 | 23.40 | 21.05 | 18.71 | 18.71 | 9.36 | 9.62 | 4.68 |
| 53 | 22.96 | 20.65 | 18.36 | 18.36 | 9.18 | 9.44 | 4.59 |
| 54 | 22.46 | 20.27 | 18.02 | 18.02 | 9.01 | 9.22 | 4.51 |
| 55 | 22.12 | 19.90 | 17.68 | 17.68 | 8.85 | 9.09 | 4.42 |
| 56 | 21.73 | 19.55 | 17.38 | 17.38 | 8.69 | 8.93 | 4.34 |
| 57 | 21.35 | 19.20 | 17.05 | 17.05 | 8.54 | 8.77 | 4.27 |
| 58 | 20.98 | 18.87 | 16.78 | 16.78 | 8.39 | 8.62 | 4.19 |
| Const's | 1216.95 | 1094.82 | 973.17 | 973.17 | 486.78 | 500.10 | 243.29 |

BAND DRIVE

Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter.

Cylinder 8 inch Diameter. Ratio Cylinder to Whirl 1 to 7.08.

Whirl 1 inch Diameter. Front Roll Gear 108 Teeth

| Change | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|---------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Gears | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 59T | 20.62 | 18.55 | 16.49 | 16.49 | 8.25 | 8.48 | 4.12 |
| 60 | 20.28 | 18.24 | 16.22 | 16.22 | 8.11 | 8.33 | 4.06 |
| 61 | 19.95 | 17.94 | 15.94 | 15.94 | 7.98 | 8.20 | 3.99 |
| 62 | 19.62 | 17.65 | 15.70 | 15.70 | 7.85 | 8.07 | 3.92 |
| 63 | 19.31 | 17.37 | 15.45 | 15.45 | 7.72 | 7.94 | 3.86 |
| 64 | 19.01 | 17.10 | 15.21 | 15.21 | 7.60 | 7.81 | 3.80 |
| 65 | 18.72 | 16.84 | 14.97 | 14.97 | 7.48 | 7.69 | 3.74 |
| 66 | 18.43 | 16.58 | 14.74 | 14.74 | 7.37 | 7.58 | 3.69 |
| 67 | 18.16 | 16.34 | 14.52 | 14.52 | 7.26 | 7.46 | 3.63 |
| 68 | 17.89 | 16.10 | 14.31 | 14.31 | 7.15 | 7.35 | 3.58 |
| 69 | 17.63 | 15.86 | 14.10 | 14.10 | 7.05 | 7.25 | 3.53 |
| 70 | 17.38 | 15.64 | 13.90 | 13.90 | 6.95 | 7.11 | 3.46 |
| 71 | 17.14 | 15.42 | 13.71 | 13.71 | 6.85 | 7.04 | 3.43 |
| 72 | 16.90 | 15.20 | 13.52 | 13.52 | 6.76 | 6.95 | 3.38 |
| 73 | 16.67 | 14.91 | 13.33 | 13.33 | 6.66 | 6.85 | 3.33 |
| 74 | 16.44 | 14.79 | 13.15 | 13.15 | 6.57 | 6.76 | 3.29 |
| 75 | 16.22 | 14.59 | 12.98 | 12.98 | 6.49 | 6.67 | 3.24 |
| 76 | 16.01 | 14.40 | 12.81 | 12.81 | 6.40 | 6.58 | 3.20 |
| 77 | 15.80 | 14.21 | 12.64 | 12.64 | 6.32 | 6.49 | 3.16 |
| 78 | 15.60 | 14.03 | 12.48 | 12.48 | 6.24 | 6.41 | 3.12 |
| 79 | 15.40 | 13.85 | 12.32 | 12.32 | 6.16 | 6.33 | 3.08 |
| 80 | 15.21 | 13.68 | 12.16 | 12.16 | 6.08 | 6.25 | 3.04 |
| 81 | 15.02 | 13.51 | 12.01 | 12.01 | 6.00 | 6.17 | 3.00 |
| 82 | 14.84 | 13.35 | 11.87 | 11.87 | 5.93 | 6.11 | 2.97 |
| 83 | 14.66 | 13.19 | 11.72 | 11.72 | 5.86 | 6.03 | 2.93 |
| 84 | 14.48 | 13.03 | 11.59 | 11.59 | 5.79 | 5.95 | 2.90 |
| 85 | 14.31 | 12.88 | 11.45 | 11.45 | 5.72 | 5.88 | 2.86 |
| 86 | 14.15 | 12.73 | 11.32 | 11.32 | 5.66 | 5.82 | 2.83 |
| 87 | 14.98 | 12.58 | 11.19 | 11.19 | 5.59 | 5.75 | 2.80 |
| 88 | 14.82 | 12.44 | 11.06 | 11.06 | 5.53 | 5.68 | 2.76 |
| 89 | 13.67 | 12.30 | 10.92 | 10.92 | 5.46 | 5.62 | 2.73 |
| 90 | 13.52 | 12.16 | 10.81 | 10.81 | 5.40 | 5.55 | 2.70 |
| 91 | 13.37 | 12.03 | 10.69 | | 5.34 | 5.50 | 2.67 |
| 92 | 13.22 | 11.90 | 10.58 | | 5.29 | 5.44 | 2.64 |
| 93 | 13.08 | 11.77 | 10.46 | | 5.23 | 5.38 | 2.62 |
| 94 | 12.94 | 11.64 | 10.35 | | 5.17 | 5.32 | 2.59 |
| | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears |
| | 36'' Frame 24-94 T | 36'' Frame 30-94 T | 36'' Frame 30-94 T | 36'' Frame 40-88 T | 36'' Frame 15-94 T | 36'' Frame 28-94 T | 36'' Frame 30-94 T |
| | 39'' Frame 15-70 T | 39'' Frame 15-86 T | 39'' Frame 15-86 T | 39'' Frame 24-90 T | 39'' Frame 15-94 T | 39'' Frame 15-94 T | 39'' Frame 15-94 T |
| Const's | 1216.95 | 1094.82 | 973.17 | 973.17 | 486.78 | 500.10 | 243.29 |

BAND DRIVE Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter.

Cylinder 8 inch Diameter. Ratio Cylinder to Whirl 1 to 6.80.

Whirl $1\frac{1}{8}$ inch Diameter. Front Roll Gear 108 Teeth.

| Change | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|---------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Gears | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 15T | 77.92 | 70.10 | 62.31 | | 31.16 | 32.02 | 15.58 |
| 16 | 73.05 | 65.78 | 58.42 | | 29.22 | 30.02 | 14.60 |
| 17 | 68.75 | 61.85 | 54.98 | | 27.50 | 28.25 | 13.75 |
| 18 | 64.93 | 58.41 | 57.93 | | 25.97 | 28.68 | 12.98 |
| 19 | 61.51 | 55.34 | 49.19 | | 24.60 | 25.28 | 12.30 |
| 20 | 58.44 | 52.57 | 46.73 | | 23.38 | 24.01 | 11.68 |
| 21 | 55.65 | 50.07 | 44.51 | | 22.26 | 22.87 | 11.13 |
| 22 | 53.12 | 47.79 | 42.48 | | 21.25 | 21.83 | 10.62 |
| 23 | 50.81 | 45.71 | 40.64 | | 20.32 | 20.88 | 10.16 |
| 24 | 48.70 | 43.81 | 38.94 | 38.94 | 19.48 | 20.01 | 9.74 |
| 25 | 46.75 | 42.06 | 37.39 | 37.39 | 18.70 | 19.21 | 9.35 |
| 26 | 44.95 | 40.44 | 35.95 | 35.95 | 17.98 | 18.47 | 8.99 |
| 27 | 43.29 | 38.94 | 34.62 | 34.62 | 17.31 | 17.79 | 8.65 |
| 28 | 41.74 | 37.55 | 33.38 | 33.38 | 16.69 | 17.15 | 8.34 |
| 29 | 40.30 | 36.25 | 32.23 | 32.23 | 16.12 | 16.56 | 8.06 |
| 30 | 38.96 | 35.05 | 31.15 | 31.15 | 15.58 | 16.01 | 7.79 |
| 31 | 37.70 | 33.92 | 30.15 | 30.15 | 15.08 | 15.49 | 7.54 |
| 32 | 36.52 | 32.86 | 29.21 | 29.21 | 14.61 | 15.01 | 7.30 |
| 33 | 35.41 | 31.86 | 28.32 | 28.32 | 14.16 | 14.55 | 7.08 |
| 34 | 34.37 | 30.92 | 27.49 | 27.49 | 13.75 | 14.13 | 6.87 |
| 35 | 33.39 | 30.04 | 26.70 | 26.70 | 13.35 | 13.72 | 6.68 |
| 36 | 32.46 | 29.20 | 25.96 | 25.96 | 12.98 | 13.34 | 6.49 |
| 37 | 31.59 | 28.41 | 25.26 | 25.26 | 12.63 | 12.98 | 6.32 |
| 38 | 30.75 | 27.67 | 24.60 | 24.60 | 12.30 | 12.64 | 6.15 |
| 39 | 29.97 | 26.96 | 23.97 | 23.97 | 11.98 | 12.32 | 5.99 |
| 40 | 29.22 | 26.28 | 23.37 | 23.37 | 11.68 | 12.00 | 5.84 |
| 41 | 28.50 | 25.64 | 22.80 | 22.80 | 11.40 | 11.71 | 5.70 |
| 42 | 27.82 | 25.03 | 22.25 | 22.25 | 11.13 | 11.44 | 5.56 |
| 43 | 27.18 | 24.45 | 21.74 | 21.74 | 10.87 | 11.17 | 5.43 |
| 44 | 26.56 | 23.89 | 21.24 | 21.24 | 10.62 | 10.91 | 5.31 |
| 45 | 25.97 | 23.36 | 20.77 | 20.77 | 10.38 | 10.67 | 5.19 |
| 46 | 25.40 | 22.85 | 20.32 | 20.32 | 10.16 | 10.44 | 5.08 |
| 47 | 24.86 | 22.37 | 19.89 | 19.89 | 9.94 | 10.22 | 4.97 |
| 48 | 24.35 | 21.90 | 19.47 | 19.47 | 9.74 | 10.01 | 4.87 |
| 49 | 23.85 | 21.45 | 19.08 | 19.08 | 9.54 | 9.80 | 4.77 |
| 50 | 23.37 | 21.03 | 18.69 | 18.69 | 9.35 | 9.61 | 4.67 |
| 51 | 22.91 | 20.61 | 18.33 | 18.33 | 9.16 | 9.42 | 4.58 |
| 52 | 22.47 | 20.22 | 17.97 | 17.97 | 8.99 | 9.23 | 4.49 |
| 53 | 22.05 | 19.84 | 17.64 | 17.64 | 8.82 | 9.06 | 4.41 |
| 54 | 21.64 | 19.47 | 17.31 | 17.31 | 8.65 | 8.90 | 4.33 |
| 55 | 21.25 | 19.11 | 16.99 | 16.99 | 8.50 | 8.73 | 4.25 |
| 56 | 20.87 | 18.77 | 16.69 | 16.69 | 8.34 | 8.58 | 4.17 |
| 57 | 20.50 | 18.44 | 16.40 | 16.40 | 8.20 | 8.42 | 4.10 |
| 58 | 20.15 | 18.12 | 16.11 | 16.11 | 8.06 | 8.28 | 4.03 |
| Const's | 1168.83 | 1051.52 | 934.69 | 934.69 | 467.53 | 480.32 | 233.67 |

BAND DRIVE

Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter

Cylinder 8 inches Diameter. Ratio Cylinder to Whirl 1 to 6.80

Whirl $1\frac{1}{16}$ inch Diameter Front Roll Gear 108 Teeth

| Change Gears | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|-----------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 59T | 19.81 | 17.82 | 15.84 | 15.84 | 7.92 | 8.14 | 3.96 |
| 60 | 19.48 | 17.52 | 15.58 | 15.58 | 7.79 | 8.01 | 3.89 |
| 61 | 19.16 | 17.23 | 15.32 | 15.32 | 7.66 | 7.87 | 3.83 |
| 62 | 18.85 | 16.96 | 15.08 | 15.08 | 7.54 | 7.75 | 3.77 |
| 63 | 18.55 | 16.69 | 14.84 | 14.84 | 7.42 | 7.62 | 3.71 |
| 64 | 18.26 | 16.43 | 14.60 | 14.60 | 7.30 | 7.51 | 3.65 |
| 65 | 17.98 | 16.17 | 14.38 | 14.38 | 7.19 | 7.39 | 3.59 |
| 66 | 17.70 | 15.93 | 14.16 | 14.16 | 7.08 | 7.28 | 3.54 |
| 67 | 17.44 | 15.69 | 13.95 | 13.95 | 6.97 | 7.17 | 3.49 |
| 68 | 17.18 | 15.46 | 13.75 | 13.75 | 6.87 | 7.06 | 3.43 |
| 69 | 16.93 | 15.23 | 13.55 | 13.55 | 6.77 | 6.96 | 3.39 |
| 70 | 16.69 | 15.02 | 13.35 | 13.35 | 6.67 | 6.86 | 3.34 |
| 71 | 16.46 | 14.81 | 13.16 | 13.16 | 6.58 | 6.76 | 3.29 |
| 72 | 16.23 | 14.60 | 13.00 | 13.00 | 6.49 | 6.67 | 3.24 |
| 73 | 16.01 | 14.40 | 12.80 | 12.80 | 6.40 | 6.58 | 3.20 |
| 74 | 15.79 | 14.21 | 12.63 | 12.63 | 6.31 | 6.49 | 3.16 |
| 75 | 15.58 | 14.02 | 12.46 | 12.46 | 6.23 | 6.40 | 3.11 |
| 76 | 15.37 | 13.83 | 12.30 | 12.30 | 6.15 | 6.32 | 3.07 |
| 77 | 15.17 | 13.65 | 12.14 | 12.14 | 6.07 | 6.24 | 3.03 |
| 78 | 14.98 | 13.48 | 11.98 | 11.98 | 5.99 | 6.16 | 3.00 |
| 79 | 14.79 | 13.31 | 11.83 | 11.83 | 5.91 | 6.08 | 2.96 |
| 80 | 14.61 | 13.14 | 11.68 | 11.68 | 5.84 | 6.00 | 2.92 |
| 81 | 14.43 | 12.98 | 11.54 | 11.54 | 5.77 | 5.93 | 2.88 |
| 82 | 14.25 | 12.82 | 11.40 | 11.40 | 5.70 | 5.86 | 2.85 |
| 83 | 14.08 | 12.66 | 11.26 | 11.26 | 5.63 | 5.79 | 2.82 |
| 84 | 13.91 | 12.51 | 11.13 | 11.13 | 5.56 | 5.72 | 2.78 |
| 85 | 13.75 | 12.37 | 11.00 | 11.00 | 5.50 | 5.65 | 2.75 |
| 86 | 13.59 | 12.22 | 10.87 | 10.87 | 5.43 | 5.59 | 2.72 |
| 87 | 13.43 | 12.08 | 10.74 | 10.74 | 5.37 | 5.52 | 2.69 |
| 88 | 13.28 | 11.94 | 10.62 | 10.62 | 5.31 | 5.46 | 2.66 |
| 89 | 13.13 | 11.81 | 10.50 | 10.50 | 5.25 | 5.40 | 2.62 |
| 90 | 12.98 | 11.68 | 10.39 | 10.39 | 5.19 | 5.34 | 2.60 |
| 91 | 12.84 | 11.55 | 10.27 | | 5.13 | 5.28 | 2.57 |
| 92 | 12.70 | 11.42 | 10.16 | | 5.08 | 5.22 | 2.54 |
| 93 | 12.56 | 11.30 | 10.05 | | 5.02 | 5.16 | 2.51 |
| 94 | 12.43 | 11.18 | 9.94 | | 4.97 | 5.11 | 2.49 |
| | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears |
| | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame | 36'' Frame |
| | 24-94 T | 30-94 T | 30-94 T | 40-88 T | 15-94 T | 28-94 T | 30-94 T |
| | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame | 39'' Frame |
| | 15-70 T | 15-86 T | 15-86 T | 24-90 T | 15-94 T | 15-94 T | 15-94 T |
| Const's | 1168.83 | 1051.52 | 934.69 | 934.69 | 467.53 | 480.32 | 233.67 |

BAND DRIVE

Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter.

Cylinder 8 inch Diameter. Ratio Cylinder to Whirl 1 to 6.22.

Whirl $1\frac{1}{2}$ inch Diameter. Front Roll Gear 108 Teeth.

| Change | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|---------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Gears | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 15T | 71.27 | 64.12 | 57.00 | | 28.51 | 29.29 | 14.25 |
| 16 | 66.82 | 60.11 | 53.44 | | 26.72 | 27.46 | 13.36 |
| 17 | 62.89 | 56.57 | 50.29 | | 25.15 | 25.84 | 12.57 |
| 18 | 59.39 | 53.43 | 47.50 | | 23.75 | 24.41 | 11.87 |
| 19 | 56.27 | 50.62 | 45.00 | | 22.50 | 23.12 | 11.25 |
| 20 | 53.45 | 48.09 | 42.75 | | 21.38 | 21.97 | 10.69 |
| 21 | 50.91 | 45.80 | 40.71 | | 20.36 | 20.92 | 10.18 |
| 22 | 48.59 | 43.71 | 38.86 | | 19.43 | 19.97 | 9.72 |
| 23 | 46.44 | 41.81 | 37.17 | | 18.59 | 19.10 | 9.29 |
| 24 | 44.54 | 40.07 | 35.62 | 35.62 | 17.81 | 18.30 | 8.91 |
| 25 | 42.76 | 38.47 | 34.20 | 35.20 | 17.10 | 17.57 | 8.55 |
| 26 | 41.12 | 36.99 | 32.88 | 32.88 | 16.44 | 16.90 | 8.22 |
| 27 | 39.59 | 35.62 | 31.66 | 31.66 | 15.83 | 16.27 | 7.92 |
| 28 | 38.18 | 34.35 | 30.53 | 30.53 | 15.27 | 15.69 | 7.63 |
| 29 | 36.86 | 33.16 | 29.48 | 29.48 | 14.74 | 15.15 | 7.37 |
| 30 | 35.63 | 32.06 | 28.50 | 28.50 | 14.25 | 14.65 | 7.12 |
| 31 | 34.48 | 31.02 | 27.58 | 27.58 | 13.79 | 14.17 | 6.89 |
| 32 | 33.41 | 30.05 | 26.72 | 26.72 | 13.36 | 13.73 | 6.68 |
| 33 | 32.39 | 29.14 | 25.91 | 25.91 | 12.95 | 13.31 | 6.48 |
| 34 | 31.44 | 28.28 | 25.15 | 25.15 | 12.57 | 12.92 | 6.29 |
| 35 | 30.54 | 27.48 | 24.43 | 24.43 | 12.21 | 12.55 | 6.11 |
| 36 | 29.69 | 26.72 | 23.75 | 23.75 | 11.89 | 12.20 | 5.94 |
| 37 | 28.89 | 25.99 | 23.11 | 23.11 | 11.55 | 11.87 | 5.78 |
| 38 | 28.13 | 25.31 | 22.50 | 22.50 | 11.25 | 11.56 | 5.62 |
| 39 | 27.41 | 24.66 | 21.92 | 21.92 | 10.96 | 11.27 | 5.48 |
| 40 | 26.72 | 24.04 | 21.37 | 21.37 | 10.69 | 10.98 | 5.34 |
| 41 | 26.07 | 23.45 | 20.85 | 20.85 | 10.43 | 10.72 | 5.21 |
| 42 | 25.45 | 22.90 | 20.36 | 20.36 | 10.18 | 10.46 | 5.09 |
| 43 | 24.86 | 22.37 | 19.88 | 19.88 | 9.94 | 10.22 | 4.97 |
| 44 | 24.29 | 21.85 | 19.43 | 19.43 | 9.71 | 9.99 | 4.86 |
| 45 | 23.75 | 21.37 | 19.00 | 19.00 | 9.50 | 9.76 | 4.75 |
| 46 | 23.24 | 20.90 | 18.59 | 18.59 | 9.29 | 9.55 | 4.65 |
| 47 | 22.74 | 20.46 | 18.19 | 18.19 | 9.09 | 9.35 | 4.55 |
| 48 | 22.27 | 20.03 | 17.81 | 17.81 | 8.90 | 9.15 | 4.45 |
| 49 | 21.81 | 19.62 | 17.45 | 17.45 | 8.72 | 8.97 | 4.36 |
| 50 | 21.38 | 19.23 | 17.10 | 17.10 | 8.55 | 8.79 | 4.27 |
| 51 | 20.96 | 18.85 | 16.76 | 16.76 | 8.38 | 8.61 | 4.19 |
| 52 | 20.56 | 18.49 | 16.44 | 16.44 | 8.22 | 8.45 | 4.11 |
| 53 | 20.17 | 18.14 | 16.13 | 16.13 | 8.07 | 8.29 | 4.03 |
| 54 | 19.79 | 17.81 | 15.83 | 15.83 | 7.91 | 8.14 | 3.96 |
| 55 | 19.43 | 17.48 | 15.54 | 15.54 | 7.77 | 7.99 | 3.89 |
| 56 | 19.09 | 17.17 | 15.27 | 15.27 | 7.63 | 7.85 | 3.82 |
| 57 | 18.75 | 16.87 | 15.00 | 15.00 | 7.50 | 7.71 | 3.76 |
| 58 | 18.43 | 16.58 | 14.74 | 14.74 | 7.37 | 7.58 | 3.68 |
| Const's | 1069.13 | 961.83 | 854.96 | 854.96 | 427.65 | 439.35 | 213.74 |

BAND DRIVE

Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter.

Cylinder 8 inch Diameter.

Ratio Cylinder to Whirl 1 to 6.22.

Whirl 1½ inch Diameter.

Front Roll Gear 108 Teeth.

| Change Gears | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|-----------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 59T | 18.12 | 16.30 | 14.49 | 14.49 | 7.24 | 7.45 | 3.62 |
| 60 | 17.81 | 16.03 | 14.25 | 14.25 | 7.12 | 7.32 | 3.57 |
| 61 | 17.52 | 15.76 | 14.01 | 14.01 | 7.01 | 7.20 | 3.50 |
| 62 | 17.24 | 15.51 | 13.79 | 13.79 | 6.90 | 7.09 | 3.45 |
| 63 | 16.97 | 15.26 | 13.57 | 13.57 | 6.78 | 6.97 | 3.39 |
| 64 | 16.70 | 15.02 | 13.36 | 13.36 | 6.68 | 6.86 | 3.34 |
| 65 | 16.44 | 14.79 | 13.15 | 13.15 | 6.58 | 6.76 | 3.29 |
| 66 | 16.19 | 14.57 | 12.95 | 12.95 | 6.48 | 6.66 | 3.24 |
| 67 | 15.95 | 14.35 | 12.76 | 12.76 | 6.38 | 6.56 | 3.19 |
| 68 | 15.72 | 14.14 | 12.57 | 12.57 | 6.28 | 6.46 | 3.14 |
| 69 | 15.49 | 13.93 | 12.39 | 12.39 | 6.20 | 6.37 | 3.10 |
| 70 | 15.27 | 13.74 | 12.21 | 12.21 | 6.10 | 6.28 | 3.05 |
| 71 | 15.05 | 13.54 | 12.04 | 12.04 | 6.02 | 6.19 | 3.01 |
| 72 | 14.88 | 13.35 | 11.87 | 11.87 | 5.94 | 6.10 | 2.97 |
| 73 | 14.64 | 13.17 | 11.71 | 11.71 | 5.84 | 6.02 | 2.92 |
| 74 | 14.44 | 12.99 | 11.55 | 11.55 | 5.78 | 5.94 | 2.89 |
| 75 | 14.25 | 12.82 | 11.40 | 11.40 | 5.70 | 5.86 | 2.85 |
| 76 | 14.06 | 12.65 | 11.25 | 11.25 | 5.62 | 5.78 | 2.81 |
| 77 | 13.88 | 12.49 | 11.10 | 11.10 | 5.55 | 5.71 | 2.78 |
| 78 | 13.70 | 12.33 | 10.96 | 10.96 | 5.48 | 5.63 | 2.74 |
| 79 | 13.53 | 12.17 | 10.82 | 10.82 | 5.41 | 5.56 | 2.71 |
| 80 | 13.36 | 12.02 | 10.69 | 10.69 | 5.34 | 5.49 | 2.67 |
| 81 | 13.19 | 11.87 | 10.56 | 10.56 | 5.27 | 5.42 | 2.64 |
| 82 | 13.03 | 11.72 | 10.43 | 10.43 | 5.21 | 5.36 | 2.61 |
| 83 | 12.88 | 11.58 | 10.30 | 10.30 | 5.15 | 5.29 | 2.58 |
| 84 | 12.72 | 11.45 | 10.18 | 10.18 | 5.09 | 5.23 | 2.54 |
| 85 | 12.57 | 11.31 | 10.06 | 10.06 | 5.03 | 5.17 | 2.51 |
| 86 | 12.43 | 11.18 | 9.94 | 9.94 | 4.97 | 5.11 | 2.49 |
| 87 | 12.28 | 11.05 | 9.83 | 9.83 | 4.91 | 5.05 | 2.46 |
| 88 | 12.14 | 10.92 | 9.72 | 9.72 | 4.85 | 4.99 | 2.43 |
| 89 | 12.01 | 10.80 | 9.61 | 9.61 | 4.80 | 4.94 | 2.40 |
| 90 | 11.87 | 10.68 | 9.50 | 9.50 | 4.75 | 4.88 | 2.37 |
| 91 | 11.74 | 10.56 | 9.40 | | 4.69 | 4.83 | 2.34 |
| 92 | 11.62 | 10.45 | 9.29 | | 4.64 | 4.78 | 2.32 |
| 93 | 11.49 | 10.34 | 9.19 | | 4.59 | 4.72 | 2.30 |
| 94 | 11.37 | 10.23 | 9.10 | | 4.54 | 4.67 | 2.27 |
| Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears |
| 36" Frame | 36" Frame | 36" Frame | 36" Frame | 36" Frame | 36" Frame | 36" Frame | 36" Frame |
| 24-94 T | 30-94 T | 30-94 T | 40-88 T | 15-94 T | 28-94 T | 30-94 T | |
| 39" Frame | 39" Frame | 39" Frame | 39" Frame | 39" Frame | 39" Frame | 39" Frame | 39" Frame |
| 15-70 T | 15-86 T | 15-86 T | 24-90 T | 15-94 T | 15-94 T | 15-94 T | |
| Const's | 1069.13 | 961.83 | 854.96 | 854.96 | 427.65 | 439.35 | 213.74 |

BAND DRIVE Spinning Twist Gear Table.

FRONT ROLL 1 inch Diameter

Cylinder 8 inches Diameter. Ratio Cylinder to Whirl 1 to 5.48
Whirl 1 $\frac{5}{16}$ inch Diameter. Front Roll Gear 108 Teeth

| Change | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|---------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Gears | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 15T | 62.79 | 56.49 | 50.22 | | 25.10 | 25.80 | 12.55 |
| 16 | 58.87 | 52.96 | 47.08 | | 23.54 | 24.19 | 11.77 |
| 17 | 55.40 | 49.84 | 44.31 | | 22.16 | 22.77 | 11.08 |
| 18 | 52.33 | 47.07 | 41.85 | | 20.93 | 21.50 | 10.46 |
| 19 | 49.57 | 44.60 | 39.64 | | 19.83 | 20.37 | 9.91 |
| 20 | 47.09 | 42.37 | 37.66 | | 18.83 | 19.35 | 9.41 |
| 21 | 44.85 | 40.35 | 35.87 | | 17.94 | 18.43 | 8.97 |
| 22 | 42.81 | 38.51 | 34.24 | | 17.12 | 17.59 | 8.56 |
| 23 | 40.95 | 36.84 | 32.75 | | 16.37 | 16.83 | 8.19 |
| 24 | 39.24 | 35.30 | 31.38 | 31.38 | 15.69 | 16.13 | 7.85 |
| 25 | 37.67 | 33.89 | 30.13 | 30.13 | 15.07 | 15.48 | 7.53 |
| 26 | 36.22 | 32.59 | 28.97 | 28.97 | 14.49 | 14.89 | 7.24 |
| 27 | 34.88 | 31.38 | 27.90 | 27.90 | 13.95 | 14.34 | 6.97 |
| 28 | 33.64 | 30.26 | 26.90 | 26.90 | 13.45 | 13.82 | 6.72 |
| 29 | 32.48 | 29.22 | 25.97 | 25.97 | 12.99 | 13.35 | 6.49 |
| 30 | 31.39 | 28.24 | 25.11 | 25.11 | 12.55 | 12.90 | 6.28 |
| 31 | 30.38 | 27.33 | 24.30 | 24.30 | 12.15 | 12.49 | 6.07 |
| 32 | 29.43 | 26.48 | 23.54 | 23.54 | 11.77 | 12.10 | 5.88 |
| 33 | 28.54 | 25.67 | 22.83 | 22.83 | 11.41 | 11.73 | 5.74 |
| 34 | 27.70 | 24.92 | 22.15 | 22.15 | 11.08 | 11.38 | 5.54 |
| 35 | 26.91 | 24.21 | 21.52 | 21.52 | 10.76 | 11.06 | 5.38 |
| 36 | 26.16 | 23.53 | 20.92 | 20.92 | 10.46 | 10.75 | 5.23 |
| 37 | 25.45 | 22.90 | 20.33 | 20.36 | 10.18 | 10.46 | 5.09 |
| 38 | 24.78 | 22.30 | 19.82 | 19.82 | 9.91 | 10.19 | 4.96 |
| 39 | 24.15 | 21.72 | 19.31 | 19.31 | 9.66 | 9.93 | 4.83 |
| 40 | 23.54 | 21.18 | 18.83 | 18.83 | 9.41 | 9.68 | 4.71 |
| 41 | 22.97 | 20.66 | 18.37 | 18.37 | 9.18 | 9.44 | 4.59 |
| 42 | 22.40 | 20.17 | 17.93 | 17.93 | 8.97 | 9.22 | 4.48 |
| 43 | 21.90 | 19.70 | 17.52 | 17.52 | 8.76 | 9.01 | 4.38 |
| 44 | 21.40 | 19.25 | 17.12 | 17.12 | 8.56 | 8.80 | 4.28 |
| 45 | 20.93 | 18.83 | 16.74 | 16.74 | 8.37 | 8.60 | 4.18 |
| 46 | 20.47 | 18.42 | 16.37 | 16.37 | 8.19 | 8.41 | 4.09 |
| 47 | 20.04 | 18.03 | 16.03 | 16.03 | 8.01 | 8.24 | 4.01 |
| 48 | 19.62 | 17.65 | 15.69 | 15.69 | 7.84 | 8.06 | 3.92 |
| 49 | 19.22 | 17.29 | 15.37 | 15.37 | 7.68 | 7.90 | 3.84 |
| 50 | 18.83 | 16.94 | 15.06 | 15.06 | 7.53 | 7.74 | 3.77 |
| 51 | 18.46 | 16.61 | 14.77 | 14.77 | 7.38 | 7.59 | 3.69 |
| 52 | 18.11 | 16.29 | 14.49 | 14.49 | 7.24 | 7.44 | 3.62 |
| 53 | 17.77 | 15.98 | 14.21 | 14.21 | 7.10 | 7.30 | 3.55 |
| 54 | 17.44 | 15.69 | 13.95 | 13.95 | 6.97 | 7.17 | 3.49 |
| 55 | 17.12 | 15.40 | 13.70 | 13.70 | 6.85 | 7.04 | 3.42 |
| 56 | 16.82 | 15.13 | 13.45 | 13.45 | 6.72 | 6.91 | 3.36 |
| 57 | 16.52 | 14.86 | 13.21 | 13.21 | 6.61 | 6.79 | 3.30 |
| 58 | 16.24 | 14.61 | 12.99 | 12.99 | 6.49 | 6.67 | 3.25 |
| Const's | 941.94 | 847.40 | 753.25 | 753.25 | 376.77 | 387.08 | 188.31 |

BAND DRIVE

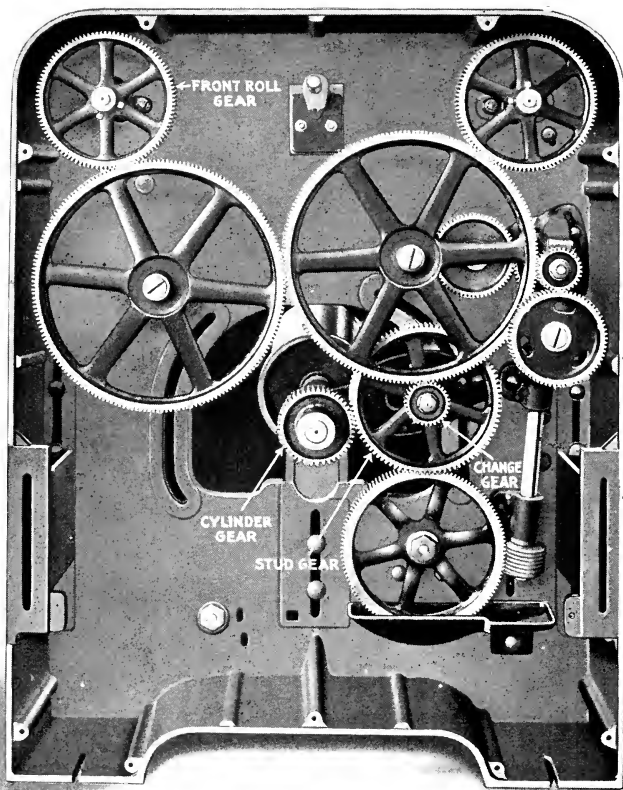
Spinning Twist Gear Table

FRONT ROLL 1 inch Diameter

Cylinder 8 inches diameter. Ratio Cylinder to Whirl 1 to 5.48

Whirl 1 $\frac{5}{16}$ inch diameter. Front Roll gear 108 teeth

| Change Gears | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 90 T | Cyl. 22 T Stud 88 T | Cyl. 20 T Stud 80 T | Cyl. 40 T Stud 80 T | Cyl. 36 T Stud 74 T | Cyl. 55 T Stud 55 T |
|----------------------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Twist | Twist | Twist | Twist | Twist | Twist | Twist |
| 59T | 15.96 | 14.36 | 12.77 | 12.77 | 6.38 | 6.56 | 3.19 |
| 60 | 15.69 | 14.12 | 12.55 | 12.55 | 6.27 | 6.45 | 3.14 |
| 61 | 15.44 | 13.89 | 12.35 | 12.35 | 6.17 | 6.35 | 3.09 |
| 62 | 15.19 | 13.66 | 12.15 | 12.15 | 6.07 | 6.24 | 3.04 |
| 63 | 14.94 | 13.45 | 11.96 | 11.96 | 5.98 | 6.14 | 2.99 |
| 64 | 14.71 | 13.24 | 11.77 | 11.77 | 5.88 | 6.05 | 2.94 |
| 65 | 14.49 | 13.03 | 11.59 | 11.59 | 5.79 | 5.96 | 2.90 |
| 66 | 14.27 | 12.84 | 11.41 | 11.41 | 5.70 | 5.86 | 2.85 |
| 67 | 14.05 | 12.64 | 11.24 | 11.24 | 5.62 | 5.78 | 2.81 |
| 68 | 13.85 | 12.46 | 11.08 | 11.08 | 5.54 | 5.69 | 2.77 |
| 69 | 13.65 | 12.28 | 10.92 | 10.92 | 5.46 | 5.61 | 2.73 |
| 70 | 13.45 | 12.10 | 10.76 | 10.76 | 5.38 | 5.53 | 2.69 |
| 71 | 13.26 | 11.93 | 10.61 | 10.61 | 5.30 | 5.45 | 2.65 |
| 72 | 13.08 | 11.77 | 10.46 | 10.46 | 5.23 | 5.38 | 2.62 |
| 73 | 12.90 | 11.60 | 10.32 | 10.32 | 5.16 | 5.30 | 2.58 |
| 74 | 12.72 | 11.45 | 10.18 | 10.18 | 5.09 | 5.23 | 2.54 |
| 75 | 12.55 | 11.29 | 10.04 | 10.04 | 5.02 | 5.16 | 2.51 |
| 76 | 12.39 | 11.15 | 9.91 | 9.91 | 4.95 | 5.09 | 2.48 |
| 77 | 12.23 | 11.00 | 9.78 | 9.78 | 4.89 | 5.03 | 2.45 |
| 78 | 12.07 | 10.86 | 9.66 | 9.66 | 4.82 | 4.96 | 2.41 |
| 79 | 11.92 | 10.72 | 9.53 | 9.53 | 4.76 | 4.90 | 2.38 |
| 80 | 11.77 | 10.59 | 9.42 | 9.42 | 4.70 | 4.84 | 2.35 |
| 81 | 11.62 | 10.46 | 9.30 | 9.30 | 4.65 | 4.78 | 2.32 |
| 82 | 11.48 | 10.33 | 9.19 | 9.19 | 4.59 | 4.72 | 2.30 |
| 83 | 11.34 | 10.20 | 9.08 | 9.08 | 4.53 | 4.66 | 2.27 |
| 84 | 11.21 | 10.08 | 8.97 | 8.97 | 4.48 | 4.61 | 2.24 |
| 85 | 11.08 | 9.96 | 8.86 | 8.86 | 4.43 | 4.55 | 2.22 |
| 86 | 10.95 | 9.85 | 8.76 | 8.76 | 4.38 | 4.50 | 2.19 |
| 87 | 10.82 | 9.74 | 8.66 | 8.66 | 4.33 | 4.45 | 2.16 |
| 88 | 10.70 | 9.62 | 8.56 | 8.56 | 4.28 | 4.40 | 2.14 |
| 89 | 10.58 | 9.52 | 8.46 | 8.46 | 4.23 | 4.35 | 2.12 |
| 90 | 10.46 | 9.41 | 8.37 | 8.37 | 4.18 | 4.30 | 2.09 |
| 91 | 10.35 | 9.31 | 8.28 | | 4.14 | 4.25 | 2.07 |
| 92 | 10.23 | 9.21 | 8.19 | | 4.09 | 4.21 | 2.05 |
| 93 | 10.12 | 9.11 | 8.10 | | 4.05 | 4.16 | 2.02 |
| 94 | 10.02 | 9.01 | 8.01 | | 4.00 | 4.12 | 2.00 |
| Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears | Change Gears |
| 36" Frame 24-94 T | 36" Frame 30-94 T | 36" Frame 30-94 T | 36" Frame 40-88 T | 36" Frame 15-94 T | 36" Frame 28-94 T | 36" Frame 30-94 T | |
| 39" Frame 15-70 T | 39" Frame 15-86 T | 39" Frame 15-86 T | 39" Frame 24-90 T | 39" Frame 15-94 T | 39" Frame 15-94 T | 39" Frame 15-94 T | |
| Const's | 941.94 | 847.40 | 753.25 | 753.25 | 376.77 | 387.08 | 188.31 |



Tape Drive Spinning Frame Twist Gearing

Formula for figuring twist:

C = Cylinder Gear.

S = Stud Gear.

T = Change Gear.

$$\frac{F \times S \times R}{C \times T \times D} = \text{Twist per inch.}$$

$$\frac{\text{Twist Constant}}{\text{Change Gear}} = \text{Twist per inch.}$$

F = Front Roll Gear.

R = Ratio Whirl to Cylinder.

D = Circumference of Front Roll.

$$\frac{F \times S \times R}{C \times D} = \text{Twist Constant.}$$

$$\frac{\text{Twist Constant}}{\text{Twist per inch.}} = \text{Change Gear.}$$

TAPE DRIVE

TWIST GEARING CONSTANTS FOR WHITIN SPINNING FRAME

| 8 Inch Cylinder | | | | | | | | | |
|---------------------------|-------------------------|---------------------------|------------|-----------|-----------------------|-----------------------|------------|-----------|-----------|
| Front Roll 1 in. Dia. | | | | | Front Roll Gear 100 T | | | | |
| Diameter of Whirl | Ratio Whirl to Cylinder | Front Roll 1 1/8 in. Dia. | | | | Front Roll Gear 100 T | | | |
| | | Cyl. 26 T | Stud 132 T | Cyl. 26 T | Stud 112 T | Cyl. 26 T | Stud 92 T | Cyl. 46 T | Stud 69 T |
| 7/8 in. | 7.80 | 1260.50 | Const's | 878.53 | Const's | 496.56 | Const's | 248.28 | Const's |
| 1 1/16 in. | 7.27 | 1174.85 | 996.84 | 818.84 | 231.41 | 462.82 | 231.41 | 248.28 | 280.11 |
| 1 1/8 in. | 6.81 | 1100.52 | 933.77 | 767.02 | 433.53 | 216.76 | 1 1/16 in. | 204.19 | 264.19 |
| 1 1/4 in. | 6.43 | 1038.52 | 881.66 | 724.22 | 409.34 | 204.67 | 1 1/8 in. | 248.28 | 248.28 |
| 1 1/2 in. | 6.09 | 984.17 | 835.40 | 685.93 | 387.70 | 193.85 | 1 1/4 in. | 232.36 | 232.36 |
| 1 3/4 in. | 5.22 | 843.36 | 715.75 | 587.94 | 332.31 | 166.16 | 1 1/2 in. | 222.81 | 222.81 |
| Front Roll 1 1/8 in. Dia. | | | | | Front Roll Gear 100 T | | | | |
| 7/8 in. | 7.80 | 1120.41 | 930.68 | 780.90 | 441.38 | 220.69 | 1 1/16 in. | 248.99 | 248.99 |
| 1 1/16 in. | 7.27 | 1044.31 | 886.08 | 727.85 | 411.39 | 205.69 | 1 1/8 in. | 234.84 | 234.84 |
| 1 1/8 in. | 6.81 | 978.24 | 830.02 | 681.81 | 385.37 | 192.68 | 1 1/4 in. | 220.69 | 220.69 |
| 1 1/4 in. | 6.43 | 923.64 | 783.70 | 643.75 | 363.86 | 181.93 | 1 1/2 in. | 206.54 | 206.54 |
| 1 1/2 in. | 6.09 | 874.79 | 742.26 | 609.71 | 344.62 | 172.31 | 1 3/4 in. | 198.06 | 198.06 |
| 1 3/4 in. | 5.22 | 749.84 | 636.23 | 522.61 | 295.39 | 147.69 | 1 1/2 in. | 166.93 | 166.93 |

Rule to find Change Gear:—Divide Constant by Twist per Inch Required.

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 7.80

Whirl $\frac{7}{8}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15T | 84.03 | 71.30 | 58.56 | 33.10 | 16.55 |
| 16 | 78.78 | 66.84 | 54.90 | 31.03 | 15.51 |
| 17 | 74.14 | 62.91 | 52.03 | 29.20 | 14.60 |
| 18 | 70.02 | 59.41 | 48.80 | 27.58 | 13.78 |
| 19 | 66.34 | 56.29 | 46.23 | 26.13 | 13.06 |
| 20 | 63.02 | 53.47 | 43.92 | 24.82 | 12.41 |
| 21 | 60.02 | 50.92 | 41.83 | 23.64 | 11.82 |
| 22 | 57.29 | 48.61 | 39.93 | 22.57 | 11.28 |
| 23 | 54.80 | 46.50 | 38.19 | 21.41 | 10.79 |
| 24 | 52.52 | 44.56 | 36.60 | 20.69 | 10.34 |
| 25 | 50.42 | 42.78 | 35.14 | 19.86 | 9.93 |
| 26 | 48.48 | 41.13 | 33.79 | 19.09 | 9.54 |
| 27 | 46.68 | 39.61 | 32.53 | 18.39 | 9.19 |
| 28 | 45.01 | 38.25 | 31.37 | 17.73 | 8.86 |
| 29 | 43.47 | 36.88 | 30.29 | 17.12 | 8.56 |
| 30 | 42.01 | 35.65 | 29.28 | 16.55 | 8.27 |
| 31 | 40.66 | 34.50 | 28.34 | 16.01 | 8.00 |
| 32 | 39.38 | 33.42 | 27.45 | 15.51 | 7.75 |
| 33 | 38.19 | 32.40 | 26.63 | 15.04 | 7.52 |
| 34 | 37.07 | 31.45 | 25.83 | 14.60 | 7.30 |
| 35 | 36.01 | 30.54 | 25.10 | 14.18 | 7.09 |
| 36 | 35.01 | 29.70 | 24.40 | 13.79 | 6.89 |
| 37 | 34.06 | 28.90 | 23.74 | 13.42 | 6.71 |
| 38 | 33.17 | 28.14 | 23.11 | 13.06 | 6.53 |
| 39 | 32.32 | 27.42 | 22.52 | 12.73 | 6.37 |
| 40 | 31.51 | 26.73 | 21.96 | 12.41 | 6.20 |
| 41 | 30.74 | 26.08 | 21.42 | 12.11 | 6.05 |
| 42 | 30.01 | 25.46 | 20.91 | 11.82 | 5.91 |
| 43 | 29.31 | 24.87 | 20.43 | 11.54 | 5.77 |
| 44 | 28.65 | 24.30 | 19.96 | 11.28 | 5.64 |
| 45 | 28.01 | 23.76 | 19.52 | 11.03 | 5.51 |
| 46 | 27.40 | 23.25 | 19.09 | 10.79 | 5.39 |
| 47 | 26.82 | 22.75 | 18.69 | 10.71 | 5.28 |
| 48 | 26.26 | 22.28 | 18.30 | 10.34 | 5.17 |
| 49 | 25.72 | 21.82 | 17.92 | 10.13 | 5.06 |
| 50 | 25.21 | 21.39 | 17.57 | 9.93 | 4.96 |
| 51 | 24.71 | 20.97 | 17.22 | 9.69 | 4.86 |
| 52 | 24.24 | 20.56 | 16.89 | 9.54 | 4.77 |
| 53 | 23.78 | 20.17 | 16.57 | 9.36 | 4.68 |
| 54 | 23.34 | 19.80 | 16.26 | 9.19 | 4.59 |
| 55 | 22.91 | 19.44 | 15.97 | 9.02 | 4.51 |
| 56 | 22.50 | 19.12 | 15.68 | 8.86 | 4.43 |
| 57 | 22.11 | 18.76 | 15.41 | 8.71 | 4.35 |
| 58 | 21.73 | 18.44 | 15.14 | 8.56 | 4.28 |
| Const's | 1260.50 | 1069.51 | 878.53 | 496.56 | 248.28 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 7 inches Diameter Ratio Cylinder to Whirl 1 to 7.80
 Whirl $\frac{7}{8}$ inch Diameter Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 21.36 | 18.12 | 14.89 | 8.41 | 4.20 |
| 60 | 21.00 | 17.82 | 14.64 | 8.27 | 4.13 |
| 61 | 20.61 | 17.53 | 14.40 | 8.14 | 4.07 |
| 62 | 20.33 | 17.25 | 14.17 | 8.00 | 4.00 |
| 63 | 20.00 | 16.94 | 13.92 | 7.88 | 3.94 |
| 64 | 19.69 | 16.71 | 13.72 | 7.75 | 3.87 |
| 65 | 19.39 | 16.45 | 13.51 | 7.63 | 3.81 |
| 66 | 19.09 | 16.20 | 13.31 | 7.52 | 3.76 |
| 67 | 18.81 | 15.96 | 13.11 | 7.41 | 3.70 |
| 68 | 18.52 | 15.72 | 12.91 | 7.30 | 3.65 |
| 69 | 18.26 | 15.50 | 12.73 | 7.19 | 3.59 |
| 70 | 18.00 | 15.27 | 12.55 | 7.09 | 3.54 |
| 71 | 17.75 | 15.06 | 12.37 | 6.99 | 3.49 |
| 72 | 17.50 | 14.85 | 12.20 | 6.89 | 3.44 |
| 73 | 17.26 | 14.65 | 12.03 | 6.80 | 3.40 |
| 74 | 17.03 | 14.45 | 11.87 | 6.71 | 3.35 |
| 75 | 16.80 | 14.26 | 11.71 | 6.62 | 3.31 |
| 76 | 16.58 | 14.07 | 11.55 | 6.53 | 3.26 |
| 77 | 16.37 | 13.88 | 11.40 | 6.44 | 3.22 |
| 78 | 16.16 | 13.71 | 11.26 | 6.36 | 3.18 |
| 79 | 15.95 | 13.53 | 11.10 | 6.28 | 3.14 |
| 80 | 15.75 | 13.36 | 10.98 | 6.20 | 3.10 |
| 81 | 15.56 | 13.20 | 10.84 | 6.13 | 3.06 |
| 82 | 15.37 | 13.04 | 10.71 | 6.05 | 3.02 |
| 83 | 15.18 | 12.88 | 10.58 | 5.98 | 2.99 |
| 84 | 15.00 | 12.75 | 10.45 | 5.91 | 2.95 |
| 85 | 14.82 | 12.58 | 10.33 | 5.81 | 2.92 |
| 86 | 14.65 | 12.43 | 10.21 | 5.77 | 2.88 |
| 87 | 14.48 | 12.29 | 10.09 | 5.70 | 2.85 |
| 88 | 14.31 | 12.15 | 9.98 | 5.64 | 2.82 |
| 89 | 14.16 | 12.01 | 9.87 | 5.57 | 2.78 |
| 90 | 14.00 | 11.88 | 9.76 | 5.51 | 2.74 |
| 91 | 13.85 | 11.75 | 9.65 | 5.45 | 2.72 |
| 92 | 13.70 | 11.62 | 9.54 | 5.39 | 2.69 |
| 93 | 13.55 | 11.50 | 9.44 | 5.33 | 2.66 |
| 94 | 13.41 | 11.37 | 9.34 | 5.28 | 2.64 |
| 96 | 13.13 | 11.14 | 9.15 | 5.17 | 2.58 |
| 98 | 12.86 | 10.97 | 8.95 | 5.06 | 2.53 |
| 100 | 12.60 | 10.69 | 8.78 | 4.96 | 2.48 |
| 102 | 12.35 | 10.48 | 8.61 | 4.86 | 2.43 |
| 104 | 12.11 | 10.28 | 8.44 | 4.77 | 2.38 |
| 106 | 11.89 | 10.08 | 8.28 | 4.68 | 2.34 |
| 108 | 11.67 | 9.90 | 8.13 | 4.59 | 2.29 |
| 110 | 11.45 | 9.72 | 7.98 | 4.51 | 2.25 |
| Const's | 1260.50 | 1069.51 | 878.53 | 496.56 | 248.28 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 7.27

Whirl $\frac{15}{16}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15T | 78.32 | 66.45 | 54.58 | 30.85 | 15.42 |
| 16 | 73.43 | 62.30 | 51.17 | 28.92 | 14.46 |
| 17 | 69.11 | 58.63 | 48.16 | 27.22 | 13.61 |
| 18 | 65.27 | 55.33 | 45.49 | 25.71 | 12.85 |
| 19 | 61.83 | 52.42 | 43.09 | 24.35 | 12.17 |
| 20 | 58.74 | 49.84 | 40.94 | 23.14 | 11.53 |
| 21 | 55.95 | 47.43 | 38.99 | 22.03 | 11.01 |
| 22 | 53.40 | 45.31 | 37.22 | 21.03 | 10.51 |
| 23 | 51.08 | 43.34 | 35.60 | 20.12 | 10.06 |
| 24 | 48.95 | 41.53 | 34.11 | 19.28 | 9.64 |
| 25 | 46.99 | 39.84 | 32.75 | 18.51 | 9.25 |
| 26 | 45.19 | 38.32 | 31.49 | 17.80 | 8.90 |
| 27 | 43.51 | 36.92 | 30.36 | 17.20 | 8.56 |
| 28 | 41.95 | 35.60 | 29.28 | 16.52 | 8.27 |
| 29 | 40.51 | 34.37 | 28.23 | 15.95 | 7.99 |
| 30 | 39.16 | 33.23 | 27.29 | 15.43 | 7.71 |
| 31 | 37.90 | 32.15 | 26.40 | 14.92 | 7.45 |
| 32 | 36.71 | 31.15 | 25.58 | 14.46 | 7.23 |
| 33 | 35.60 | 30.20 | 24.82 | 14.02 | 7.01 |
| 34 | 34.55 | 29.31 | 24.08 | 13.61 | 6.80 |
| 35 | 33.56 | 28.48 | 23.38 | 13.22 | 6.61 |
| 36 | 32.63 | 27.67 | 22.74 | 12.86 | 6.43 |
| 37 | 31.75 | 26.94 | 22.14 | 12.50 | 6.25 |
| 38 | 30.93 | 26.21 | 21.54 | 12.18 | 6.09 |
| 39 | 30.12 | 25.56 | 20.98 | 11.86 | 5.93 |
| 40 | 29.37 | 24.92 | 20.47 | 11.57 | 5.77 |
| 41 | 28.65 | 24.31 | 19.96 | 11.30 | 5.64 |
| 42 | 27.97 | 23.72 | 19.49 | 11.02 | 5.51 |
| 43 | 27.32 | 23.18 | 19.04 | 10.76 | 5.38 |
| 44 | 26.70 | 22.65 | 18.61 | 10.52 | 5.26 |
| 45 | 26.10 | 22.15 | 18.18 | 10.28 | 5.14 |
| 46 | 25.54 | 21.62 | 17.80 | 10.06 | 5.03 |
| 47 | 24.99 | 21.20 | 17.42 | 9.84 | 4.92 |
| 48 | 24.47 | 20.77 | 17.06 | 9.64 | 4.82 |
| 49 | 23.97 | 20.34 | 16.70 | 9.46 | 4.72 |
| 50 | 23.49 | 19.92 | 16.38 | 9.28 | 4.62 |
| 51 | 23.03 | 19.56 | 16.08 | 9.08 | 4.54 |
| 52 | 22.59 | 19.16 | 15.78 | 8.92 | 4.44 |
| 53 | 22.16 | 18.80 | 15.44 | 8.74 | 4.36 |
| 54 | 21.75 | 18.46 | 15.18 | 8.60 | 4.28 |
| 55 | 21.36 | 18.14 | 14.90 | 8.44 | 4.20 |
| 56 | 20.98 | 17.80 | 14.64 | 8.38 | 4.13 |
| 57 | 20.61 | 17.48 | 14.39 | 8.12 | 4.06 |
| 58 | 20.25 | 17.18 | 14.14 | 7.96 | 3.99 |
| Const's | 1174.85 | 996.84 | 818.84 | 462.82 | 231.41 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 7 inches Diameter Ratio Cylinder to Whirl 1 to 7.27
 Whirl $\frac{15}{16}$ inch Diameter Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 19.91 | 16.89 | 13.89 | 7.83 | 3.92 |
| 60 | 19.58 | 16.62 | 13.64 | 7.71 | 3.85 |
| 61 | 19.26 | 16.34 | 13.41 | 7.58 | 3.79 |
| 62 | 18.95 | 16.07 | 13.20 | 7.46 | 3.73 |
| 63 | 18.65 | 15.81 | 12.99 | 7.34 | 3.67 |
| 64 | 18.35 | 15.57 | 12.79 | 7.23 | 3.63 |
| 65 | 18.07 | 15.33 | 12.58 | 7.12 | 3.56 |
| 66 | 17.80 | 15.10 | 12.41 | 7.01 | 3.50 |
| 67 | 17.53 | 14.87 | 12.22 | 6.90 | 3.45 |
| 68 | 17.27 | 14.65 | 12.04 | 6.80 | 3.40 |
| 69 | 17.02 | 14.44 | 11.87 | 6.70 | 3.35 |
| 70 | 16.78 | 14.24 | 11.69 | 6.61 | 3.31 |
| 71 | 16.54 | 14.04 | 11.53 | 6.52 | 3.26 |
| 72 | 16.32 | 13.83 | 11.37 | 6.43 | 3.21 |
| 73 | 16.09 | 13.65 | 11.22 | 6.34 | 3.17 |
| 74 | 15.87 | 13.47 | 11.07 | 6.25 | 3.13 |
| 75 | 15.66 | 13.25 | 10.92 | 6.17 | 3.08 |
| 76 | 15.45 | 13.14 | 10.77 | 6.09 | 3.04 |
| 77 | 15.26 | 12.94 | 10.63 | 6.01 | 3.00 |
| 78 | 15.06 | 12.78 | 10.49 | 5.93 | 2.96 |
| 79 | 14.87 | 12.61 | 10.36 | 5.86 | 2.93 |
| 80 | 14.68 | 12.46 | 10.24 | 5.79 | 2.89 |
| 81 | 14.50 | 12.30 | 10.11 | 5.72 | 2.85 |
| 82 | 14.33 | 12.16 | 9.98 | 5.65 | 2.82 |
| 83 | 14.15 | 12.01 | 9.86 | 5.58 | 2.78 |
| 84 | 13.98 | 11.86 | 9.74 | 5.51 | 2.75 |
| 85 | 13.82 | 11.71 | 9.63 | 5.44 | 2.72 |
| 86 | 13.66 | 11.59 | 9.52 | 5.38 | 2.69 |
| 87 | 13.50 | 11.46 | 9.41 | 5.32 | 2.66 |
| 88 | 13.35 | 11.33 | 9.31 | 5.26 | 2.63 |
| 89 | 13.20 | 11.20 | 9.20 | 5.20 | 2.60 |
| 90 | 13.05 | 11.08 | 9.09 | 5.14 | 2.57 |
| 91 | 12.91 | 10.94 | 8.99 | 5.08 | 2.54 |
| 92 | 12.77 | 10.81 | 8.90 | 5.03 | 2.52 |
| 93 | 12.63 | 10.70 | 8.80 | 4.97 | 2.49 |
| 94 | 12.49 | 10.60 | 8.71 | 4.92 | 2.46 |
| 96 | 12.24 | 10.38 | 8.53 | 4.82 | 2.41 |
| 98 | 11.99 | 10.17 | 8.35 | 4.73 | 2.36 |
| 100 | 11.74 | 9.96 | 8.19 | 4.64 | 2.31 |
| 102 | 11.52 | 9.78 | 8.04 | 4.54 | 2.27 |
| 104 | 10.29 | 9.58 | 7.89 | 4.46 | 2.22 |
| 106 | 10.10 | 9.40 | 7.72 | 4.37 | 2.18 |
| 108 | 9.90 | 9.23 | 7.59 | 4.30 | 2.14 |
| 110 | 9.69 | 9.07 | 7.45 | 4.22 | 2.10 |
| Const's | 1174.85 | 996.84 | 818.84 | 462.82 | 231.41 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 7 inches Diameter
Whirl 1 inch Diameter

Ratio Cylinder to Whirl 1 to 6.81
Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15T | 73.36 | 66.25 | 51.13 | 28.90 | 14.45 |
| 16 | 68.78 | 62.11 | 47.94 | 27.09 | 13.54 |
| 17 | 64.73 | 58.46 | 45.11 | 25.50 | 12.75 |
| 18 | 61.14 | 55.21 | 42.61 | 24.08 | 12.04 |
| 19 | 57.92 | 52.30 | 40.37 | 22.81 | 11.40 |
| 20 | 55.02 | 49.68 | 38.35 | 21.67 | 10.83 |
| 21 | 52.40 | 47.32 | 36.52 | 20.65 | 10.32 |
| 22 | 50.02 | 45.17 | 34.86 | 19.70 | 9.85 |
| 23 | 47.85 | 43.20 | 33.34 | 18.85 | 9.42 |
| 24 | 45.85 | 41.40 | 31.96 | 18.06 | 9.03 |
| 25 | 44.02 | 39.75 | 30.68 | 17.34 | 8.67 |
| 26 | 42.33 | 38.22 | 29.50 | 16.68 | 8.34 |
| 27 | 40.76 | 36.80 | 28.41 | 16.06 | 8.03 |
| 28 | 39.30 | 35.49 | 27.39 | 15.48 | 7.74 |
| 29 | 37.95 | 34.27 | 26.45 | 14.93 | 7.46 |
| 30 | 36.68 | 33.12 | 25.56 | 14.45 | 7.22 |
| 31 | 35.50 | 32.06 | 24.76 | 13.98 | 6.99 |
| 32 | 34.39 | 31.05 | 23.97 | 13.54 | 6.77 |
| 33 | 33.41 | 30.11 | 23.24 | 13.12 | 6.56 |
| 34 | 32.36 | 29.23 | 22.55 | 12.75 | 6.37 |
| 35 | 31.44 | 28.39 | 21.91 | 12.38 | 6.19 |
| 36 | 30.57 | 27.60 | 21.30 | 12.04 | 6.02 |
| 37 | 29.74 | 26.86 | 20.73 | 11.71 | 5.85 |
| 38 | 28.96 | 26.15 | 20.18 | 11.40 | 5.70 |
| 39 | 28.22 | 25.48 | 19.66 | 11.11 | 5.55 |
| 40 | 27.51 | 24.89 | 19.17 | 10.83 | 5.41 |
| 41 | 26.84 | 24.24 | 18.70 | 10.57 | 5.28 |
| 42 | 26.20 | 23.66 | 18.26 | 10.32 | 5.16 |
| 43 | 25.59 | 23.11 | 17.84 | 10.08 | 5.04 |
| 44 | 25.01 | 22.58 | 17.43 | 9.85 | 4.97 |
| 45 | 24.45 | 22.08 | 17.04 | 9.63 | 4.86 |
| 46 | 23.92 | 21.60 | 16.67 | 9.42 | 4.71 |
| 47 | 23.41 | 21.14 | 16.32 | 9.22 | 4.61 |
| 48 | 22.92 | 20.70 | 15.98 | 9.03 | 4.51 |
| 49 | 22.45 | 20.28 | 15.65 | 8.84 | 4.42 |
| 50 | 22.01 | 19.87 | 15.34 | 8.67 | 4.32 |
| 51 | 21.58 | 19.48 | 15.04 | 8.50 | 4.25 |
| 52 | 21.16 | 19.11 | 14.75 | 8.33 | 4.16 |
| 53 | 20.76 | 18.74 | 14.47 | 8.18 | 4.09 |
| 54 | 20.38 | 18.40 | 14.20 | 8.03 | 4.01 |
| 55 | 20.01 | 18.07 | 13.94 | 7.88 | 3.94 |
| 56 | 19.65 | 17.74 | 13.66 | 7.74 | 3.87 |
| 57 | 19.31 | 17.43 | 13.45 | 7.60 | 3.80 |
| 58 | 18.97 | 17.13 | 13.22 | 7.46 | 3.73 |
| Const's | 1100.52 | 993.77 | 767.02 | 433.53 | 216.76 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 7 inches Diameter Ratio Cylinder to Whirl 1 to 6.81
 Whirl 1 inch Diameter Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 18.65 | 16.84 | 13.00 | 7.34 | 3.67 |
| 60 | 18.34 | 16.56 | 12.78 | 7.22 | 3.61 |
| 61 | 18.04 | 16.29 | 12.57 | 7.10 | 3.55 |
| 62 | 17.75 | 16.03 | 12.38 | 6.99 | 3.49 |
| 63 | 17.47 | 15.77 | 12.17 | 6.88 | 3.44 |
| 64 | 17.19 | 15.52 | 11.98 | 6.77 | 3.38 |
| 65 | 16.93 | 15.35 | 11.80 | 6.67 | 3.33 |
| 66 | 16.70 | 15.05 | 11.62 | 6.56 | 3.28 |
| 67 | 16.42 | 14.83 | 11.45 | 6.47 | 3.23 |
| 68 | 16.18 | 14.61 | 11.28 | 6.37 | 3.18 |
| 69 | 15.95 | 14.40 | 11.11 | 6.28 | 3.14 |
| 70 | 15.72 | 14.19 | 10.95 | 6.19 | 3.09 |
| 71 | 15.50 | 13.99 | 10.80 | 6.10 | 3.05 |
| 72 | 15.28 | 13.80 | 10.65 | 6.02 | 3.01 |
| 73 | 15.08 | 13.61 | 10.50 | 5.93 | 2.96 |
| 74 | 14.87 | 13.43 | 10.36 | 5.85 | 2.92 |
| 75 | 14.67 | 13.25 | 10.23 | 5.78 | 2.89 |
| 76 | 14.48 | 13.07 | 10.09 | 5.70 | 2.85 |
| 77 | 14.30 | 12.90 | 9.96 | 5.63 | 2.81 |
| 78 | 14.11 | 12.74 | 9.83 | 5.55 | 2.77 |
| 79 | 13.93 | 12.58 | 9.71 | 5.48 | 2.74 |
| 80 | 13.75 | 12.44 | 9.58 | 5.41 | 2.70 |
| 81 | 13.58 | 12.26 | 9.48 | 5.35 | 2.67 |
| 82 | 13.42 | 12.12 | 9.35 | 5.28 | 2.64 |
| 83 | 13.25 | 11.97 | 9.24 | 5.21 | 2.60 |
| 84 | 13.10 | 11.83 | 9.13 | 5.16 | 2.58 |
| 85 | 12.95 | 11.69 | 9.02 | 5.10 | 2.55 |
| 86 | 12.79 | 11.55 | 8.94 | 5.04 | 2.52 |
| 87 | 12.65 | 11.42 | 8.81 | 4.98 | 2.49 |
| 88 | 12.50 | 11.29 | 8.71 | 4.92 | 2.46 |
| 89 | 12.36 | 11.17 | 8.61 | 4.87 | 2.43 |
| 90 | 12.22 | 11.04 | 8.52 | 4.81 | 2.40 |
| 91 | 12.09 | 10.92 | 8.43 | 4.76 | 2.38 |
| 92 | 11.96 | 10.80 | 8.33 | 4.71 | 2.35 |
| 93 | 11.83 | 10.68 | 8.24 | 4.66 | 2.33 |
| 94 | 11.70 | 10.57 | 8.16 | 4.61 | 2.30 |
| 96 | 11.41 | 10.35 | 7.99 | 4.51 | 2.25 |
| 98 | 11.22 | 10.14 | 7.82 | 4.42 | 2.21 |
| 100 | 11.00 | 9.93 | 7.67 | 4.33 | 2.16 |
| 102 | 10.79 | 9.74 | 7.52 | 4.25 | 2.12 |
| 104 | 10.58 | 9.55 | 7.37 | 4.16 | 2.08 |
| 106 | 10.38 | 9.37 | 7.23 | 4.09 | 2.04 |
| 108 | 10.19 | 9.20 | 7.10 | 4.01 | 2.00 |
| 110 | 10.00 | 9.03 | 6.97 | 3.94 | 1.97 |
| Const's | 1100.52 | 993.77 | 767.02 | 433.53 | 216.76 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 6.43

Whirl $1\frac{1}{16}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15T | 69.23 | 58.77 | 48.28 | 27.29 | 13.64 |
| 16 | 64.90 | 55.10 | 45.26 | 25.58 | 12.79 |
| 17 | 61.09 | 51.86 | 42.60 | 24.07 | 12.04 |
| 18 | 57.69 | 48.98 | 40.23 | 22.74 | 11.37 |
| 19 | 54.65 | 46.40 | 38.11 | 21.54 | 10.77 |
| 20 | 51.92 | 44.08 | 36.21 | 20.46 | 10.23 |
| 21 | 49.45 | 41.98 | 34.48 | 19.49 | 9.74 |
| 22 | 47.20 | 40.08 | 32.91 | 18.60 | 9.30 |
| 23 | 45.15 | 38.33 | 31.48 | 17.79 | 8.89 |
| 24 | 43.27 | 36.73 | 30.17 | 17.05 | 8.52 |
| 25 | 41.54 | 35.26 | 28.96 | 16.37 | 8.18 |
| 26 | 39.94 | 33.91 | 27.85 | 15.74 | 7.87 |
| 27 | 38.46 | 32.65 | 26.82 | 15.16 | 7.58 |
| 28 | 37.09 | 31.48 | 25.86 | 14.61 | 7.31 |
| 29 | 35.81 | 30.40 | 24.97 | 14.11 | 7.05 |
| 30 | 34.61 | 29.38 | 24.14 | 13.64 | 6.82 |
| 31 | 33.50 | 28.44 | 23.36 | 13.20 | 6.60 |
| 32 | 32.45 | 27.55 | 22.63 | 12.79 | 6.39 |
| 33 | 31.47 | 26.71 | 21.94 | 12.40 | 6.20 |
| 34 | 30.54 | 25.93 | 21.30 | 12.03 | 6.02 |
| 35 | 29.67 | 25.19 | 20.69 | 11.69 | 5.84 |
| 36 | 28.84 | 24.49 | 20.11 | 11.37 | 5.68 |
| 37 | 28.06 | 23.82 | 19.57 | 11.06 | 5.53 |
| 38 | 27.32 | 23.20 | 19.05 | 10.77 | 5.38 |
| 39 | 26.62 | 22.60 | 18.57 | 10.49 | 5.24 |
| 40 | 25.96 | 22.04 | 18.10 | 10.23 | 5.11 |
| 41 | 25.33 | 21.50 | 17.66 | 9.98 | 4.99 |
| 42 | 24.72 | 20.99 | 17.24 | 9.74 | 4.87 |
| 43 | 24.15 | 20.50 | 16.84 | 9.52 | 4.76 |
| 44 | 23.60 | 20.04 | 16.45 | 9.30 | 4.65 |
| 45 | 23.07 | 19.59 | 16.09 | 9.09 | 4.54 |
| 46 | 22.57 | 19.16 | 15.74 | 8.89 | 4.44 |
| 47 | 22.09 | 18.75 | 15.40 | 8.71 | 4.35 |
| 48 | 21.63 | 18.36 | 15.08 | 8.52 | 4.26 |
| 49 | 21.19 | 17.99 | 14.78 | 8.35 | 4.17 |
| 50 | 20.77 | 17.63 | 14.48 | 8.18 | 4.09 |
| 51 | 20.36 | 17.28 | 14.20 | 8.02 | 4.01 |
| 52 | 19.97 | 16.95 | 13.92 | 7.87 | 3.93 |
| 53 | 19.59 | 16.63 | 13.66 | 7.72 | 3.86 |
| 54 | 19.23 | 16.32 | 13.41 | 7.58 | 3.79 |
| 55 | 18.88 | 16.03 | 13.16 | 7.44 | 3.72 |
| 56 | 18.54 | 15.74 | 12.93 | 7.30 | 3.65 |
| 57 | 18.21 | 15.46 | 12.70 | 7.18 | 3.59 |
| 58 | 17.90 | 15.20 | 12.48 | 7.05 | 3.52 |
| Const's | 1038.52 | 881.66 | 724.22 | 409.34 | 204.67 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 6.43

Whirl $1\frac{1}{16}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 17.60 | 14.94 | 12.27 | 6.93 | 3.46 |
| 60 | 17.30 | 14.69 | 12.07 | 6.82 | 3.41 |
| 61 | 17.02 | 14.45 | 11.87 | 6.71 | 3.35 |
| 62 | 16.75 | 14.22 | 11.68 | 6.60 | 3.30 |
| 63 | 16.48 | 13.99 | 11.49 | 6.49 | 3.24 |
| 64 | 16.22 | 13.77 | 11.31 | 6.39 | 3.19 |
| 65 | 15.97 | 13.56 | 11.14 | 6.29 | 3.14 |
| 66 | 15.73 | 13.35 | 10.97 | 6.20 | 3.10 |
| 67 | 15.50 | 13.15 | 10.80 | 6.10 | 3.05 |
| 68 | 15.27 | 12.96 | 10.65 | 6.01 | 3.01 |
| 69 | 15.50 | 12.77 | 10.49 | 5.93 | 2.96 |
| 70 | 14.83 | 12.59 | 10.34 | 5.84 | 2.92 |
| 71 | 14.62 | 12.41 | 10.20 | 5.76 | 2.88 |
| 72 | 14.42 | 12.24 | 10.05 | 5.68 | 2.84 |
| 73 | 14.22 | 12.07 | 9.92 | 5.60 | 2.80 |
| 74 | 14.03 | 11.91 | 9.78 | 5.53 | 2.76 |
| 75 | 13.84 | 11.75 | 9.65 | 5.45 | 2.72 |
| 76 | 13.66 | 11.60 | 9.52 | 5.38 | 2.69 |
| 77 | 13.48 | 11.45 | 9.40 | 5.31 | 2.65 |
| 78 | 13.31 | 11.30 | 9.28 | 5.24 | 2.62 |
| 79 | 13.14 | 11.16 | 9.16 | 5.18 | 2.59 |
| 80 | 12.98 | 11.02 | 9.05 | 5.11 | 2.55 |
| 81 | 12.82 | 10.88 | 8.94 | 5.05 | 2.52 |
| 82 | 12.66 | 10.75 | 8.83 | 4.99 | 2.49 |
| 83 | 12.51 | 10.62 | 8.72 | 4.93 | 2.46 |
| 84 | 12.36 | 10.49 | 8.62 | 4.87 | 2.43 |
| 85 | 12.21 | 10.37 | 8.52 | 4.81 | 2.40 |
| 86 | 12.07 | 10.25 | 8.42 | 4.76 | 2.38 |
| 87 | 11.93 | 10.13 | 8.32 | 4.70 | 2.35 |
| 88 | 11.80 | 10.02 | 8.22 | 4.65 | 2.32 |
| 89 | 11.66 | 9.90 | 8.13 | 4.59 | 2.29 |
| 90 | 11.53 | 9.79 | 8.04 | 4.54 | 2.27 |
| 91 | 11.41 | 9.68 | 7.95 | 4.49 | 2.24 |
| 92 | 11.28 | 9.58 | 7.87 | 4.44 | 2.22 |
| 93 | 11.16 | 9.48 | 7.78 | 4.40 | 2.20 |
| 94 | 11.04 | 9.37 | 7.70 | 4.35 | 2.17 |
| 96 | 10.81 | 9.18 | 7.54 | 4.26 | 2.13 |
| 98 | 10.59 | 8.99 | 7.39 | 4.17 | 2.08 |
| 100 | 10.38 | 8.81 | 7.24 | 4.09 | 2.04 |
| 102 | 10.18 | 8.64 | 7.10 | 4.01 | 2.00 |
| 104 | 9.98 | 8.47 | 6.96 | 3.93 | 1.96 |
| 106 | 9.79 | 8.31 | 6.83 | 3.86 | 1.93 |
| 108 | 9.61 | 8.16 | 6.70 | 3.79 | 1.89 |
| 110 | 9.44 | 8.01 | 6.58 | 3.72 | 1.86 |
| Const's | 1038.52 | 881.66 | 724.22 | 409.34 | 204.67 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 7 inches Diameter Ratio Cylinder to Whirl 1 to 6.09
 Whirl $1\frac{1}{8}$ inch Diameter Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15T | 65.61 | 55.69 | 45.72 | 25.84 | 12.92 |
| 16 | 61.51 | 52.21 | 42.87 | 24.23 | 12.11 |
| 17 | 57.89 | 49.14 | 40.34 | 22.80 | 11.40 |
| 18 | 54.67 | 46.41 | 38.10 | 21.53 | 10.76 |
| 19 | 51.79 | 43.96 | 36.10 | 20.40 | 10.20 |
| 20 | 49.21 | 41.77 | 34.29 | 19.38 | 9.69 |
| 21 | 46.87 | 39.78 | 32.66 | 18.46 | 9.23 |
| 22 | 44.74 | 37.97 | 31.17 | 17.61 | 8.80 |
| 23 | 42.79 | 36.32 | 29.82 | 16.85 | 8.42 |
| 24 | 41.00 | 34.80 | 28.58 | 16.15 | 8.07 |
| 25 | 39.37 | 33.41 | 27.43 | 15.50 | 7.75 |
| 26 | 37.85 | 32.13 | 26.38 | 14.91 | 7.45 |
| 27 | 36.45 | 30.94 | 25.40 | 14.35 | 7.17 |
| 28 | 35.14 | 29.83 | 24.49 | 13.84 | 6.92 |
| 29 | 33.93 | 28.80 | 23.65 | 13.36 | 6.68 |
| 30 | 32.80 | 27.84 | 22.86 | 12.92 | 6.46 |
| 31 | 31.75 | 26.94 | 22.12 | 12.50 | 6.25 |
| 32 | 30.76 | 26.10 | 21.43 | 12.11 | 6.05 |
| 33 | 29.82 | 25.31 | 20.78 | 11.74 | 5.87 |
| 34 | 28.95 | 24.62 | 20.17 | 11.45 | 5.72 |
| 35 | 28.11 | 23.86 | 19.59 | 11.07 | 5.53 |
| 36 | 27.34 | 23.20 | 19.05 | 10.77 | 5.38 |
| 37 | 26.59 | 22.57 | 18.53 | 10.47 | 5.23 |
| 38 | 25.85 | 21.98 | 18.05 | 10.20 | 5.10 |
| 39 | 25.23 | 21.42 | 17.58 | 9.94 | 4.97 |
| 40 | 24.60 | 20.88 | 17.14 | 9.69 | 4.84 |
| 41 | 24.00 | 20.37 | 16.73 | 9.45 | 4.72 |
| 42 | 23.43 | 19.89 | 16.33 | 9.23 | 4.61 |
| 43 | 22.88 | 19.42 | 15.95 | 9.01 | 4.50 |
| 44 | 22.38 | 18.98 | 15.58 | 8.80 | 4.40 |
| 45 | 21.87 | 18.56 | 15.24 | 8.61 | 4.30 |
| 46 | 21.40 | 18.16 | 14.91 | 8.42 | 4.21 |
| 47 | 20.93 | 17.77 | 14.59 | 8.24 | 4.12 |
| 48 | 20.50 | 17.40 | 14.29 | 8.07 | 4.03 |
| 49 | 20.08 | 17.04 | 13.99 | 7.91 | 3.95 |
| 50 | 19.68 | 16.70 | 13.71 | 7.75 | 3.87 |
| 51 | 19.28 | 16.38 | 13.44 | 7.60 | 3.80 |
| 52 | 18.93 | 16.06 | 13.19 | 7.45 | 3.72 |
| 53 | 18.56 | 15.76 | 12.94 | 7.31 | 3.65 |
| 54 | 18.23 | 15.47 | 12.70 | 7.17 | 3.58 |
| 55 | 17.89 | 15.18 | 12.47 | 7.04 | 3.52 |
| 56 | 17.57 | 14.91 | 12.24 | 6.92 | 3.46 |
| 57 | 17.26 | 14.65 | 12.03 | 6.80 | 3.40 |
| 58 | 16.96 | 14.40 | 11.82 | 6.68 | 3.34 |
| Const's | 984.17 | 835.40 | 685.93 | 387.70 | 193.85 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 6.09

Whirl $1\frac{1}{8}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 16.68 | 14.15 | 11.62 | 6.57 | 3.28 |
| 60 | 16.40 | 13.92 | 11.43 | 6.46 | 3.23 |
| 61 | 16.13 | 13.69 | 11.24 | 6.35 | 3.17 |
| 62 | 15.87 | 13.47 | 11.06 | 6.25 | 3.12 |
| 63 | 15.62 | 13.26 | 10.88 | 6.15 | 3.07 |
| 64 | 15.37 | 13.05 | 10.71 | 6.05 | 3.02 |
| 65 | 15.14 | 12.85 | 10.55 | 5.96 | 2.98 |
| 66 | 14.91 | 12.65 | 10.39 | 5.87 | 2.93 |
| 67 | 14.68 | 12.46 | 10.23 | 5.78 | 2.89 |
| 68 | 14.47 | 12.31 | 10.08 | 5.70 | 2.85 |
| 69 | 14.26 | 12.10 | 9.94 | 5.61 | 2.80 |
| 70 | 14.05 | 11.93 | 9.79 | 5.53 | 2.76 |
| 71 | 13.86 | 11.76 | 9.66 | 5.46 | 2.73 |
| 72 | 13.66 | 11.60 | 9.52 | 5.70 | 2.85 |
| 73 | 13.48 | 11.44 | 9.39 | 5.31 | 2.65 |
| 74 | 13.27 | 11.28 | 9.26 | 5.23 | 2.61 |
| 75 | 13.12 | 11.13 | 9.14 | 5.16 | 2.58 |
| 76 | 12.95 | 10.99 | 9.02 | 5.10 | 2.55 |
| 77 | 12.81 | 10.84 | 8.90 | 5.03 | 2.51 |
| 78 | 12.61 | 10.71 | 8.79 | 4.97 | 2.48 |
| 79 | 12.45 | 10.57 | 8.68 | 4.90 | 2.45 |
| 80 | 12.30 | 10.44 | 8.57 | 4.84 | 2.42 |
| 81 | 12.15 | 10.31 | 8.46 | 4.78 | 2.39 |
| 82 | 12.00 | 10.18 | 8.36 | 4.72 | 2.36 |
| 83 | 11.85 | 10.06 | 8.26 | 4.67 | 2.33 |
| 84 | 11.71 | 9.94 | 8.16 | 4.61 | 2.30 |
| 85 | 11.57 | 9.82 | 8.06 | 4.56 | 2.28 |
| 86 | 11.44 | 9.71 | 7.97 | 4.50 | 2.25 |
| 87 | 11.31 | 9.60 | 7.88 | 4.45 | 2.22 |
| 88 | 11.18 | 9.49 | 7.79 | 4.40 | 2.20 |
| 89 | 11.05 | 9.39 | 7.70 | 4.35 | 2.17 |
| 90 | 10.93 | 9.28 | 7.62 | 4.30 | 2.15 |
| 91 | 10.82 | 9.18 | 7.53 | 4.26 | 2.13 |
| 92 | 10.69 | 9.08 | 7.45 | 4.21 | 2.10 |
| 93 | 10.58 | 8.98 | 7.37 | 4.16 | 2.08 |
| 94 | 10.46 | 8.88 | 7.29 | 4.12 | 2.06 |
| 96 | 10.25 | 8.70 | 7.14 | 4.03 | 2.01 |
| 98 | 10.04 | 8.52 | 6.99 | 3.95 | 1.97 |
| 100 | 9.84 | 8.35 | 6.85 | 3.87 | 1.93 |
| 102 | 9.64 | 8.19 | 6.72 | 3.80 | 1.90 |
| 104 | 9.46 | 8.03 | 6.59 | 3.72 | 1.86 |
| 106 | 9.28 | 7.88 | 6.47 | 3.65 | 1.82 |
| 108 | 9.11 | 7.73 | 6.35 | 3.58 | 1.79 |
| 110 | 8.94 | 7.59 | 6.23 | 3.52 | 1.76 |
| Const's | 984.17 | 835.40 | 685.93 | 387.70 | 193.85 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 5.22

Whirl $1\frac{5}{16}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15T | 56.24 | 47.72 | 39.19 | 22.15 | 11.07 |
| 16 | 52.73 | 44.73 | 36.75 | 20.76 | 10.38 |
| 17 | 49.62 | 42.10 | 34.58 | 19.55 | 9.77 |
| 18 | 46.87 | 39.76 | 32.66 | 18.46 | 9.23 |
| 19 | 44.39 | 37.67 | 30.94 | 17.49 | 8.74 |
| 20 | 42.17 | 35.80 | 29.40 | 17.62 | 8.31 |
| 21 | 40.17 | 34.08 | 28.00 | 15.82 | 7.91 |
| 22 | 38.34 | 32.53 | 26.72 | 15.10 | 7.55 |
| 23 | 36.68 | 31.12 | 25.56 | 14.45 | 7.22 |
| 24 | 35.15 | 29.82 | 24.50 | 13.85 | 6.92 |
| 25 | 33.74 | 28.63 | 23.52 | 13.29 | 6.64 |
| 26 | 32.45 | 27.54 | 22.61 | 12.78 | 6.39 |
| 27 | 31.24 | 26.51 | 21.77 | 12.30 | 6.15 |
| 28 | 30.12 | 25.56 | 21.00 | 11.87 | 5.93 |
| 29 | 29.09 | 24.68 | 20.31 | 11.46 | 5.73 |
| 30 | 28.11 | 23.86 | 19.60 | 11.08 | 5.54 |
| 31 | 27.21 | 23.09 | 18.96 | 10.72 | 5.36 |
| 32 | 26.35 | 22.36 | 18.37 | 10.38 | 5.19 |
| 33 | 25.56 | 21.69 | 17.82 | 10.07 | 5.03 |
| 34 | 24.81 | 21.05 | 17.29 | 9.97 | 4.98 |
| 35 | 24.10 | 20.45 | 16.80 | 9.49 | 4.74 |
| 36 | 23.43 | 19.88 | 16.33 | 9.23 | 4.61 |
| 37 | 22.79 | 19.34 | 15.89 | 8.98 | 4.49 |
| 38 | 22.18 | 18.83 | 15.47 | 8.74 | 4.37 |
| 39 | 21.63 | 18.35 | 15.08 | 8.52 | 4.26 |
| 40 | 21.08 | 17.90 | 14.70 | 8.31 | 4.15 |
| 41 | 20.57 | 17.46 | 14.34 | 8.10 | 4.05 |
| 42 | 27.08 | 17.04 | 14.00 | 7.91 | 3.95 |
| 43 | 19.61 | 16.64 | 13.67 | 7.73 | 3.86 |
| 44 | 19.17 | 16.26 | 13.36 | 7.55 | 3.77 |
| 45 | 18.74 | 15.91 | 13.06 | 7.38 | 3.69 |
| 46 | 18.33 | 15.56 | 12.78 | 7.22 | 3.61 |
| 47 | 17.94 | 15.23 | 12.51 | 7.07 | 3.53 |
| 48 | 17.57 | 14.91 | 12.25 | 6.92 | 3.46 |
| 49 | 17.21 | 14.61 | 12.00 | 6.78 | 3.39 |
| 50 | 16.87 | 14.31 | 11.76 | 6.64 | 3.32 |
| 51 | 16.54 | 14.03 | 11.53 | 6.52 | 3.26 |
| 52 | 16.22 | 13.77 | 11.30 | 6.39 | 3.18 |
| 53 | 15.91 | 13.50 | 11.09 | 6.25 | 3.12 |
| 54 | 15.62 | 13.25 | 10.88 | 6.15 | 3.07 |
| 55 | 15.33 | 13.01 | 10.69 | 6.04 | 3.02 |
| 56 | 15.06 | 12.78 | 10.50 | 5.98 | 2.97 |
| 57 | 14.80 | 12.56 | 10.31 | 5.83 | 2.91 |
| 58 | 14.55 | 12.34 | 10.15 | 5.73 | 2.86 |
| Const's | 843.56 | 715.75 | 587.94 | 332.31 | 166.15 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 5.22

Whirl $1\frac{5}{16}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 14.29 | 12.13 | 9.96 | 5.63 | 2.81 |
| 60 | 14.05 | 11.93 | 9.80 | 5.54 | 2.77 |
| 61 | 13.82 | 11.73 | 9.64 | 5.44 | 2.72 |
| 62 | 13.60 | 11.54 | 9.48 | 5.36 | 2.68 |
| 63 | 13.39 | 11.36 | 9.33 | 5.27 | 2.64 |
| 64 | 13.17 | 11.18 | 9.18 | 5.19 | 2.59 |
| 65 | 12.97 | 11.01 | 9.04 | 5.11 | 2.55 |
| 66 | 12.78 | 10.84 | 8.91 | 5.03 | 2.51 |
| 67 | 12.60 | 10.68 | 8.77 | 4.95 | 2.47 |
| 68 | 12.40 | 10.52 | 8.64 | 4.88 | 2.44 |
| 69 | 12.22 | 10.37 | 8.52 | 4.82 | 2.41 |
| 70 | 12.05 | 10.22 | 8.40 | 4.74 | 2.37 |
| 71 | 11.88 | 10.08 | 8.28 | 4.68 | 2.34 |
| 72 | 11.71 | 9.94 | 8.16 | 4.61 | 2.30 |
| 73 | 11.55 | 9.81 | 8.05 | 4.55 | 2.27 |
| 74 | 11.39 | 9.67 | 7.94 | 4.49 | 2.24 |
| 75 | 11.25 | 9.54 | 7.84 | 4.43 | 2.21 |
| 76 | 11.09 | 9.41 | 7.73 | 4.37 | 2.18 |
| 77 | 10.95 | 9.29 | 7.64 | 4.32 | 2.16 |
| 78 | 10.81 | 9.17 | 7.54 | 4.26 | 2.13 |
| 79 | 10.67 | 9.06 | 7.44 | 4.21 | 2.10 |
| 80 | 10.54 | 8.95 | 7.35 | 4.15 | 2.07 |
| 81 | 10.41 | 8.84 | 7.26 | 4.10 | 2.05 |
| 82 | 10.28 | 8.73 | 7.17 | 4.05 | 2.02 |
| 83 | 10.17 | 8.62 | 7.08 | 4.00 | 2.00 |
| 84 | 10.04 | 8.52 | 7.00 | 3.95 | 1.97 |
| 85 | 9.92 | 8.42 | 6.92 | 3.90 | 1.95 |
| 86 | 9.80 | 8.32 | 6.83 | 3.86 | 1.93 |
| 87 | 9.69 | 8.22 | 6.76 | 3.82 | 1.91 |
| 88 | 9.58 | 8.13 | 6.68 | 3.77 | 1.88 |
| 89 | 9.47 | 8.04 | 6.61 | 3.73 | 1.86 |
| 90 | 9.37 | 7.95 | 6.53 | 3.69 | 1.84 |
| 91 | 9.27 | 7.86 | 6.46 | 3.65 | 1.82 |
| 92 | 9.16 | 7.78 | 6.39 | 3.61 | 1.80 |
| 93 | 9.07 | 7.70 | 6.32 | 3.57 | 1.78 |
| 94 | 8.97 | 7.61 | 6.25 | 3.53 | 1.76 |
| 96 | 8.78 | 7.45 | 6.12 | 3.46 | 1.73 |
| 98 | 8.60 | 7.30 | 6.00 | 3.39 | 1.69 |
| 100 | 8.43 | 7.15 | 5.88 | 3.32 | 1.66 |
| 102 | 8.25 | 7.01 | 5.76 | 3.26 | 1.63 |
| 104 | 8.11 | 6.88 | 5.65 | 3.19 | 1.59 |
| 106 | 7.95 | 6.75 | 5.54 | 3.12 | 1.56 |
| 108 | 7.81 | 6.62 | 5.44 | 3.07 | 1.53 |
| 110 | 7.66 | 6.50 | 5.34 | 3.02 | 1.51 |
| Const's | 843.56 | 715.75 | 587.94 | 332.31 | 166.15 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 8.80

Whirl $\frac{7}{8}$ inch Diameter

Front Roll Gear 100 Teeth

| Change | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|---------|---------------------|---------------------|--------------------|--------------------|--------------------|
| Gears | Twist | Twist | Twist | Twist | Twist |
| 15T | 94.81 | 80.44 | 66.08 | 37.35 | 18.67 |
| 16 | 88.88 | 75.41 | 61.95 | 35.01 | 17.51 |
| 17 | 83.65 | 70.98 | 58.30 | 32.95 | 16.48 |
| 18 | 79.00 | 67.04 | 55.06 | 31.12 | 15.56 |
| 19 | 74.85 | 63.51 | 52.17 | 29.49 | 14.74 |
| 20 | 71.10 | 60.33 | 49.56 | 28.01 | 14.01 |
| 21 | 67.72 | 57.46 | 47.20 | 26.67 | 13.34 |
| 22 | 64.64 | 54.85 | 45.05 | 25.46 | 12.73 |
| 23 | 61.83 | 52.46 | 43.09 | 24.36 | 12.18 |
| 24 | 59.25 | 50.28 | 41.30 | 23.34 | 11.67 |
| 25 | 56.88 | 48.26 | 39.64 | 22.41 | 11.20 |
| 26 | 54.69 | 46.41 | 38.12 | 21.55 | 10.77 |
| 27 | 52.67 | 44.69 | 36.71 | 20.75 | 10.37 |
| 28 | 50.79 | 43.09 | 35.40 | 20.01 | 10.00 |
| 29 | 49.04 | 41.61 | 34.18 | 19.32 | 9.66 |
| 30 | 47.40 | 40.22 | 33.04 | 18.67 | 9.34 |
| 31 | 45.88 | 38.92 | 31.97 | 18.07 | 9.04 |
| 32 | 44.44 | 37.71 | 30.97 | 17.51 | 8.75 |
| 33 | 43.09 | 36.56 | 30.04 | 16.98 | 8.49 |
| 34 | 41.83 | 35.49 | 29.15 | 16.48 | 8.24 |
| 35 | 40.63 | 34.48 | 28.32 | 16.01 | 8.00 |
| 36 | 39.50 | 33.52 | 27.53 | 15.56 | 7.78 |
| 37 | 38.43 | 32.61 | 26.79 | 15.14 | 7.57 |
| 38 | 37.42 | 31.75 | 26.08 | 14.74 | 7.37 |
| 39 | 36.46 | 30.94 | 25.41 | 14.36 | 7.18 |
| 40 | 35.55 | 30.17 | 24.78 | 14.00 | 7.00 |
| 41 | 34.69 | 29.43 | 24.17 | 13.66 | 6.83 |
| 42 | 33.86 | 28.73 | 23.59 | 13.34 | 6.67 |
| 43 | 33.07 | 28.06 | 23.05 | 13.03 | 6.51 |
| 44 | 32.32 | 27.42 | 22.53 | 12.73 | 6.37 |
| 45 | 31.60 | 26.81 | 22.03 | 12.45 | 6.22 |
| 46 | 30.92 | 26.23 | 21.55 | 12.18 | 6.09 |
| 47 | 30.26 | 25.67 | 21.09 | 11.92 | 5.96 |
| 48 | 29.63 | 25.14 | 20.65 | 11.67 | 5.84 |
| 49 | 29.02 | 24.63 | 20.24 | 11.43 | 5.72 |
| 50 | 28.44 | 24.13 | 19.82 | 11.20 | 5.60 |
| 51 | 27.88 | 23.66 | 19.43 | 10.98 | 5.49 |
| 52 | 27.35 | 23.20 | 19.06 | 10.77 | 5.39 |
| 53 | 26.83 | 22.77 | 18.70 | 10.57 | 5.29 |
| 54 | 26.34 | 22.35 | 18.35 | 10.37 | 5.19 |
| 55 | 25.85 | 21.94 | 18.02 | 10.19 | 5.09 |
| 56 | 25.39 | 21.55 | 17.70 | 10.00 | 5.00 |
| 57 | 24.95 | 21.17 | 17.39 | 9.83 | 4.91 |
| 58 | 24.52 | 20.80 | 17.09 | 9.66 | 4.83 |
| Const's | 1422.10 | 1206.63 | 991.16 | 560.22 | 280.11 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 8.80

Whirl $\frac{7}{8}$ inches Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 24.10 | 20.45 | 16.80 | 9.50 | 4.75 |
| 60 | 23.70 | 20.11 | 16.52 | 9.34 | 4.67 |
| 61 | 23.31 | 19.78 | 16.25 | 9.18 | 4.59 |
| 62 | 22.94 | 19.46 | 15.99 | 9.04 | 4.52 |
| 63 | 22.57 | 19.15 | 15.73 | 8.89 | 4.45 |
| 64 | 22.22 | 18.86 | 15.49 | 8.75 | 4.38 |
| 65 | 21.88 | 18.56 | 15.25 | 8.62 | 4.31 |
| 66 | 21.54 | 18.28 | 15.02 | 8.49 | 4.24 |
| 67 | 21.23 | 18.01 | 14.79 | 8.36 | 4.18 |
| 68 | 20.91 | 17.75 | 14.58 | 8.24 | 4.12 |
| 69 | 20.61 | 17.49 | 14.36 | 8.12 | 4.06 |
| 70 | 20.32 | 17.24 | 14.16 | 8.00 | 4.00 |
| 71 | 20.03 | 16.99 | 13.96 | 7.89 | 3.95 |
| 72 | 19.75 | 16.76 | 13.77 | 7.78 | 3.89 |
| 73 | 19.48 | 16.53 | 13.58 | 7.67 | 3.84 |
| 74 | 19.21 | 16.31 | 13.39 | 7.57 | 3.79 |
| 75 | 18.96 | 16.09 | 13.22 | 7.47 | 3.73 |
| 76 | 18.71 | 15.88 | 13.04 | 7.37 | 3.69 |
| 77 | 18.47 | 15.67 | 12.87 | 7.28 | 3.64 |
| 78 | 18.23 | 15.47 | 12.71 | 7.18 | 3.59 |
| 79 | 18.00 | 15.27 | 12.54 | 7.09 | 3.55 |
| 80 | 17.77 | 15.08 | 12.39 | 7.00 | 3.50 |
| 81 | 17.56 | 14.90 | 12.23 | 6.92 | 3.46 |
| 82 | 17.34 | 14.72 | 12.09 | 6.83 | 3.42 |
| 83 | 17.13 | 14.54 | 11.94 | 6.75 | 3.37 |
| 84 | 16.93 | 14.36 | 11.80 | 6.67 | 3.33 |
| 85 | 16.73 | 14.20 | 11.66 | 6.59 | 3.30 |
| 86 | 16.53 | 14.03 | 11.53 | 6.51 | 3.26 |
| 87 | 16.35 | 13.87 | 11.39 | 6.44 | 3.22 |
| 88 | 16.16 | 13.71 | 11.26 | 6.37 | 3.18 |
| 89 | 15.98 | 13.56 | 11.14 | 6.29 | 3.15 |
| 90 | 15.80 | 13.41 | 11.01 | 6.22 | 3.11 |
| 91 | 15.63 | 13.26 | 10.89 | 6.16 | 3.08 |
| 92 | 15.46 | 13.12 | 10.77 | 6.09 | 3.04 |
| 93 | 15.29 | 12.97 | 10.66 | 6.02 | 3.01 |
| 94 | 15.13 | 12.84 | 10.54 | 5.96 | 2.98 |
| 96 | 14.81 | 12.57 | 10.32 | 5.84 | 2.92 |
| 98 | 14.51 | 12.31 | 10.11 | 5.72 | 2.86 |
| 100 | 14.22 | 12.07 | 9.91 | 5.60 | 2.80 |
| 102 | 13.94 | 11.83 | 9.72 | 5.49 | 2.75 |
| 104 | 13.67 | 11.60 | 9.53 | 5.39 | 2.69 |
| 106 | 13.42 | 11.38 | 9.35 | 5.29 | 2.64 |
| 108 | 13.17 | 11.18 | 9.18 | 5.19 | 2.59 |
| 110 | 12.93 | 10.97 | 9.01 | 5.09 | 2.55 |
| Const's | 1422.10 | 1206.63 | 991.16 | 560.22 | 280.11 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 8.30

Whirl $\frac{1}{8}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15T | 89.42 | 75.87 | 62.32 | 35.23 | 17.61 |
| 16 | 83.83 | 71.13 | 58.42 | 33.02 | 16.51 |
| 17 | 78.90 | 66.95 | 54.99 | 31.08 | 15.54 |
| 18 | 74.51 | 63.23 | 51.94 | 29.35 | 14.67 |
| 19 | 70.59 | 59.90 | 49.20 | 27.81 | 13.90 |
| 20 | 67.05 | 56.90 | 46.74 | 26.42 | 13.21 |
| 21 | 63.87 | 54.19 | 44.52 | 25.16 | 12.58 |
| 22 | 60.97 | 51.73 | 42.49 | 24.02 | 12.01 |
| 23 | 58.32 | 49.48 | 40.65 | 22.97 | 11.49 |
| 24 | 55.88 | 47.42 | 38.95 | 22.02 | 11.01 |
| 25 | 53.65 | 45.52 | 37.39 | 21.13 | 10.57 |
| 26 | 51.59 | 43.77 | 35.95 | 20.32 | 10.16 |
| 27 | 49.68 | 42.15 | 34.62 | 19.57 | 9.78 |
| 28 | 47.91 | 40.65 | 33.39 | 18.87 | 9.44 |
| 29 | 46.25 | 39.24 | 32.23 | 18.22 | 9.11 |
| 30 | 44.71 | 37.94 | 31.17 | 17.61 | 8.81 |
| 31 | 43.27 | 36.71 | 30.16 | 17.04 | 8.52 |
| 32 | 41.91 | 35.56 | 29.21 | 16.51 | 8.26 |
| 33 | 40.65 | 34.49 | 28.33 | 16.01 | 8.01 |
| 34 | 39.45 | 33.47 | 27.50 | 15.54 | 7.77 |
| 35 | 38.32 | 32.51 | 26.71 | 15.10 | 7.55 |
| 36 | 37.26 | 31.61 | 25.97 | 14.68 | 7.34 |
| 37 | 36.25 | 30.76 | 25.27 | 14.29 | 7.14 |
| 38 | 35.30 | 29.95 | 24.60 | 13.90 | 6.95 |
| 39 | 34.39 | 29.18 | 23.97 | 13.55 | 6.77 |
| 40 | 33.53 | 28.45 | 23.37 | 13.21 | 6.60 |
| 41 | 32.71 | 27.76 | 22.80 | 12.89 | 6.44 |
| 42 | 31.93 | 27.09 | 22.26 | 12.58 | 6.29 |
| 43 | 31.19 | 26.46 | 21.74 | 12.29 | 6.14 |
| 44 | 30.48 | 25.87 | 21.24 | 12.01 | 6.00 |
| 45 | 29.81 | 25.29 | 20.77 | 11.74 | 5.87 |
| 46 | 29.16 | 24.74 | 20.32 | 11.49 | 5.74 |
| 47 | 28.54 | 24.21 | 19.89 | 11.24 | 5.62 |
| 48 | 27.94 | 23.71 | 19.47 | 11.01 | 5.50 |
| 49 | 27.37 | 23.23 | 19.08 | 10.78 | 5.39 |
| 50 | 26.83 | 22.76 | 18.70 | 10.57 | 5.28 |
| 51 | 26.30 | 22.32 | 18.33 | 10.36 | 5.18 |
| 52 | 25.79 | 21.89 | 17.98 | 10.16 | 5.08 |
| 53 | 25.31 | 21.47 | 17.64 | 9.97 | 4.98 |
| 54 | 24.84 | 21.08 | 17.31 | 9.78 | 4.89 |
| 55 | 24.39 | 20.69 | 17.00 | 9.61 | 4.80 |
| 56 | 23.95 | 20.32 | 16.69 | 9.44 | 4.71 |
| 57 | 23.53 | 19.96 | 16.40 | 9.27 | 4.63 |
| 58 | 23.12 | 19.62 | 16.12 | 9.11 | 4.55 |
| Const's | 1341.30 | 1138.08 | 934.85 | 528.39 | 264.19 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 8.30

Whirl $\frac{15}{16}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 22.73 | 19.29 | 15.84 | 8.96 | 4.48 |
| 60 | 22.35 | 18.97 | 15.58 | 8.81 | 4.40 |
| 61 | 21.99 | 18.65 | 15.33 | 8.67 | 4.33 |
| 62 | 21.63 | 18.35 | 15.08 | 8.52 | 4.26 |
| 63 | 21.29 | 18.06 | 14.84 | 8.39 | 4.19 |
| 64 | 20.96 | 17.78 | 14.61 | 8.26 | 4.13 |
| 65 | 20.64 | 17.51 | 14.38 | 8.13 | 4.06 |
| 66 | 20.32 | 17.24 | 14.16 | 8.01 | 4.00 |
| 67 | 20.02 | 16.98 | 13.95 | 7.89 | 3.94 |
| 68 | 19.72 | 16.74 | 13.75 | 7.77 | 3.89 |
| 69 | 19.44 | 16.49 | 13.55 | 7.66 | 3.83 |
| 70 | 19.16 | 16.26 | 13.36 | 7.55 | 3.77 |
| 71 | 18.89 | 16.03 | 13.17 | 7.44 | 3.72 |
| 72 | 18.63 | 15.81 | 12.98 | 7.34 | 3.67 |
| 73 | 18.37 | 15.59 | 12.81 | 7.24 | 3.62 |
| 74 | 18.13 | 15.38 | 12.63 | 7.14 | 3.57 |
| 75 | 17.88 | 15.17 | 12.46 | 7.05 | 3.52 |
| 76 | 17.65 | 14.97 | 12.30 | 6.95 | 3.48 |
| 77 | 17.42 | 14.78 | 12.14 | 6.86 | 3.43 |
| 78 | 17.20 | 14.59 | 11.99 | 6.77 | 3.38 |
| 79 | 16.98 | 14.40 | 11.83 | 6.69 | 3.34 |
| 80 | 16.77 | 14.23 | 11.69 | 6.60 | 3.30 |
| 81 | 16.56 | 14.05 | 11.54 | 6.52 | 3.26 |
| 82 | 16.36 | 13.88 | 11.40 | 6.44 | 3.22 |
| 83 | 16.16 | 13.71 | 11.26 | 6.37 | 3.18 |
| 84 | 15.97 | 13.54 | 11.13 | 6.29 | 3.15 |
| 85 | 15.78 | 13.39 | 11.00 | 6.22 | 3.11 |
| 86 | 15.60 | 13.23 | 10.87 | 6.14 | 3.07 |
| 87 | 15.42 | 13.08 | 10.75 | 6.07 | 3.04 |
| 88 | 15.24 | 12.93 | 10.62 | 6.00 | 3.00 |
| 89 | 15.07 | 12.78 | 10.50 | 5.94 | 2.97 |
| 90 | 14.90 | 12.65 | 10.39 | 5.87 | 2.94 |
| 91 | 14.74 | 12.51 | 10.27 | 5.81 | 2.90 |
| 92 | 14.58 | 12.37 | 10.16 | 5.74 | 2.87 |
| 93 | 14.42 | 12.24 | 10.05 | 5.68 | 2.84 |
| 94 | 14.27 | 12.10 | 9.94 | 5.62 | 2.81 |
| 96 | 13.97 | 11.85 | 9.74 | 5.50 | 2.75 |
| 98 | 13.69 | 11.61 | 9.54 | 5.39 | 2.70 |
| 100 | 13.41 | 11.38 | 9.35 | 5.28 | 2.64 |
| 102 | 13.15 | 11.16 | 9.16 | 5.18 | 2.59 |
| 104 | 12.90 | 10.94 | 8.99 | 5.08 | 2.54 |
| 106 | 12.65 | 10.74 | 8.82 | 4.98 | 2.49 |
| 108 | 12.42 | 10.54 | 8.66 | 4.89 | 2.45 |
| 110 | 12.19 | 10.35 | 8.50 | 4.80 | 2.40 |
| Const's | 1341.30 | 1138.08 | 934.85 | 528.39 | 264.19 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 7.80

Whirl 1 inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15T | 84.03 | 71.30 | 58.57 | 33.10 | 16.55 |
| 16 | 78.78 | 66.84 | 54.91 | 31.03 | 15.52 |
| 17 | 74.15 | 62.91 | 51.68 | 29.21 | 14.60 |
| 18 | 70.03 | 59.42 | 48.81 | 27.58 | 13.79 |
| 19 | 66.34 | 56.29 | 46.24 | 26.13 | 13.07 |
| 20 | 63.03 | 53.47 | 43.93 | 24.83 | 12.41 |
| 21 | 60.02 | 50.93 | 41.83 | 23.64 | 11.82 |
| 22 | 57.29 | 48.61 | 39.93 | 22.57 | 11.29 |
| 23 | 54.80 | 46.50 | 38.20 | 21.59 | 10.79 |
| 24 | 52.52 | 44.56 | 36.60 | 20.69 | 10.34 |
| 25 | 50.42 | 42.78 | 35.14 | 19.86 | 9.93 |
| 26 | 48.48 | 41.13 | 33.79 | 19.10 | 9.55 |
| 27 | 46.68 | 39.61 | 32.54 | 18.39 | 9.20 |
| 28 | 45.02 | 38.19 | 31.38 | 17.73 | 8.86 |
| 29 | 43.46 | 36.88 | 30.29 | 17.12 | 8.56 |
| 30 | 42.02 | 35.65 | 29.28 | 16.55 | 8.28 |
| 31 | 40.66 | 34.50 | 28.34 | 16.02 | 8.01 |
| 32 | 39.39 | 33.42 | 27.45 | 15.52 | 7.76 |
| 33 | 38.20 | 32.41 | 26.62 | 15.05 | 7.52 |
| 34 | 37.07 | 31.46 | 25.84 | 14.60 | 7.30 |
| 35 | 36.01 | 30.56 | 25.10 | 14.19 | 7.09 |
| 36 | 35.01 | 29.71 | 24.40 | 13.79 | 6.90 |
| 37 | 34.07 | 28.91 | 23.74 | 13.42 | 6.71 |
| 38 | 33.17 | 28.14 | 23.12 | 13.07 | 6.53 |
| 39 | 32.32 | 27.42 | 22.53 | 12.73 | 6.37 |
| 40 | 31.51 | 26.74 | 21.96 | 12.41 | 6.21 |
| 41 | 30.74 | 26.09 | 21.43 | 12.11 | 6.06 |
| 42 | 30.01 | 25.46 | 20.92 | 11.82 | 5.91 |
| 43 | 29.31 | 24.87 | 20.43 | 11.55 | 5.77 |
| 44 | 28.65 | 24.31 | 19.97 | 11.28 | 5.64 |
| 45 | 28.01 | 23.77 | 19.52 | 11.03 | 5.52 |
| 46 | 27.40 | 23.25 | 19.10 | 10.79 | 5.40 |
| 47 | 26.82 | 22.76 | 18.69 | 10.57 | 5.28 |
| 48 | 26.26 | 22.28 | 18.30 | 10.35 | 5.17 |
| 49 | 25.72 | 21.83 | 17.93 | 10.13 | 5.07 |
| 50 | 25.21 | 21.39 | 17.57 | 9.93 | 4.97 |
| 51 | 24.72 | 20.97 | 17.23 | 9.74 | 4.87 |
| 52 | 24.24 | 20.57 | 16.89 | 9.55 | 4.77 |
| 53 | 23.78 | 20.18 | 16.58 | 9.37 | 4.68 |
| 54 | 23.34 | 19.81 | 16.27 | 9.20 | 4.60 |
| 55 | 22.92 | 19.45 | 15.97 | 9.03 | 4.51 |
| 56 | 22.51 | 19.10 | 15.69 | 8.87 | 4.43 |
| 57 | 22.11 | 18.76 | 15.41 | 8.71 | 4.36 |
| 58 | 21.73 | 18.44 | 15.15 | 8.56 | 4.28 |
| Const's | 1260.50 | 1069.51 | 878.53 | 496.56 | 248.28 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 8 inches Diameter Ratio Cylinder to Whirl 1 to 7.80
Whirl 1 inch Diameter Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 21.36 | 18.13 | 14.89 | 8.42 | 4.21 |
| 60 | 21.01 | 17.82 | 14.64 | 8.28 | 4.14 |
| 61 | 20.66 | 17.53 | 14.40 | 8.14 | 4.07 |
| 62 | 20.33 | 17.25 | 14.17 | 8.01 | 4.00 |
| 63 | 20.01 | 16.98 | 13.94 | 7.88 | 3.94 |
| 64 | 19.70 | 16.71 | 13.73 | 7.76 | 3.88 |
| 65 | 19.39 | 16.45 | 13.51 | 7.64 | 3.82 |
| 66 | 19.10 | 16.21 | 13.31 | 7.52 | 3.76 |
| 67 | 18.81 | 15.96 | 13.11 | 7.41 | 3.71 |
| 68 | 18.54 | 15.73 | 12.92 | 7.30 | 3.65 |
| 69 | 18.27 | 15.50 | 12.73 | 7.20 | 3.60 |
| 70 | 18.01 | 15.28 | 12.55 | 7.09 | 3.55 |
| 71 | 17.75 | 15.06 | 12.37 | 6.99 | 3.50 |
| 72 | 17.51 | 14.85 | 12.20 | 6.90 | 3.45 |
| 73 | 17.27 | 14.65 | 12.03 | 6.80 | 3.40 |
| 74 | 17.03 | 14.45 | 11.87 | 6.71 | 3.36 |
| 75 | 16.81 | 14.26 | 11.71 | 6.62 | 3.31 |
| 76 | 16.59 | 14.07 | 11.56 | 6.53 | 3.27 |
| 77 | 16.37 | 13.89 | 11.41 | 6.45 | 3.22 |
| 78 | 16.16 | 13.71 | 11.26 | 6.37 | 3.18 |
| 79 | 15.96 | 13.54 | 11.12 | 6.29 | 3.14 |
| 80 | 15.76 | 13.37 | 10.98 | 6.21 | 3.10 |
| 81 | 15.56 | 13.20 | 10.85 | 6.13 | 3.07 |
| 82 | 15.37 | 13.04 | 10.71 | 6.06 | 3.03 |
| 83 | 15.19 | 12.89 | 10.58 | 5.98 | 2.99 |
| 84 | 15.01 | 12.73 | 10.46 | 5.91 | 2.96 |
| 85 | 14.83 | 12.58 | 10.34 | 5.84 | 2.92 |
| 86 | 14.66 | 12.44 | 10.22 | 5.77 | 2.89 |
| 87 | 14.49 | 12.29 | 10.10 | 5.71 | 2.85 |
| 88 | 14.32 | 12.15 | 9.98 | 5.64 | 2.82 |
| 89 | 14.16 | 12.02 | 9.87 | 5.58 | 2.79 |
| 90 | 14.01 | 11.88 | 9.76 | 5.52 | 2.76 |
| 91 | 13.85 | 11.75 | 9.65 | 5.46 | 2.73 |
| 92 | 13.70 | 11.63 | 9.55 | 5.40 | 2.70 |
| 93 | 13.55 | 11.50 | 9.45 | 5.34 | 2.67 |
| 94 | 13.41 | 11.38 | 9.35 | 5.28 | 2.64 |
| 96 | 13.13 | 11.14 | 9.15 | 5.17 | 2.59 |
| 98 | 12.86 | 10.91 | 8.96 | 5.07 | 2.53 |
| 100 | 12.60 | 10.70 | 8.79 | 4.97 | 2.48 |
| 102 | 12.36 | 10.49 | 8.61 | 4.87 | 2.43 |
| 104 | 12.12 | 10.28 | 8.45 | 4.77 | 2.39 |
| 106 | 11.89 | 10.09 | 8.29 | 4.68 | 2.34 |
| 108 | 11.67 | 9.90 | 8.13 | 4.60 | 2.30 |
| 110 | 11.46 | 9.72 | 7.99 | 4.51 | 2.25 |
| Const's | 1260.50 | 1069.51 | 878.53 | 496.56 | 248.28 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 8 inches Diameter Ratio Cylinder to Whirl 1 to 7.30
 Whirl $1\frac{1}{16}$ inch Diameter Front Roll Gear 100 Teeth

| Change | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|---------|---------------------|---------------------|--------------------|--------------------|--------------------|
| Gears | Twist | Twist | Twist | Twist | Twist |
| 15T | 78.65 | 66.73 | 54.81 | 30.98 | 15.49 |
| 16 | 73.73 | 62.56 | 51.39 | 29.05 | 14.52 |
| 17 | 69.39 | 58.88 | 48.37 | 27.34 | 13.67 |
| 18 | 65.54 | 55.61 | 45.68 | 25.82 | 12.91 |
| 19 | 62.09 | 52.68 | 43.27 | 24.46 | 12.23 |
| 20 | 58.99 | 50.05 | 41.11 | 23.24 | 11.62 |
| 21 | 56.17 | 47.66 | 39.15 | 22.13 | 11.06 |
| 22 | 53.62 | 45.50 | 37.37 | 21.12 | 10.56 |
| 23 | 51.29 | 43.52 | 35.75 | 20.21 | 10.10 |
| 24 | 49.15 | 41.71 | 34.26 | 19.36 | 9.68 |
| 25 | 47.19 | 40.04 | 32.89 | 18.59 | 9.29 |
| 26 | 45.37 | 38.50 | 31.62 | 17.87 | 8.94 |
| 27 | 43.69 | 37.07 | 30.45 | 17.21 | 8.61 |
| 28 | 42.13 | 35.75 | 29.36 | 16.60 | 8.30 |
| 29 | 40.68 | 34.52 | 28.35 | 16.03 | 8.01 |
| 30 | 39.32 | 33.37 | 27.41 | 15.49 | 7.75 |
| 31 | 38.05 | 32.29 | 26.52 | 14.99 | 7.50 |
| 32 | 36.87 | 31.28 | 25.69 | 14.52 | 7.26 |
| 33 | 35.75 | 30.33 | 24.92 | 14.08 | 7.04 |
| 34 | 34.70 | 29.44 | 24.18 | 13.67 | 6.83 |
| 35 | 33.71 | 28.60 | 23.49 | 13.28 | 6.64 |
| 36 | 32.77 | 27.80 | 22.84 | 12.91 | 6.45 |
| 37 | 31.88 | 27.05 | 22.22 | 12.56 | 6.28 |
| 38 | 31.04 | 26.34 | 21.64 | 12.23 | 6.11 |
| 39 | 30.25 | 25.67 | 21.08 | 11.92 | 5.96 |
| 40 | 29.49 | 25.02 | 20.56 | 11.62 | 5.81 |
| 41 | 28.77 | 24.41 | 20.05 | 11.33 | 5.67 |
| 42 | 28.09 | 23.83 | 19.58 | 11.07 | 5.53 |
| 43 | 27.43 | 23.28 | 19.12 | 10.81 | 5.40 |
| 44 | 26.81 | 22.75 | 18.69 | 10.56 | 5.28 |
| 45 | 26.22 | 22.24 | 18.27 | 10.33 | 5.16 |
| 46 | 25.65 | 21.76 | 17.87 | 10.10 | 5.05 |
| 47 | 25.10 | 21.30 | 17.49 | 9.89 | 4.94 |
| 48 | 24.58 | 20.85 | 17.13 | 9.68 | 4.84 |
| 49 | 24.08 | 20.43 | 16.78 | 9.48 | 4.74 |
| 50 | 23.59 | 20.02 | 16.44 | 9.29 | 4.65 |
| 51 | 23.13 | 19.63 | 16.12 | 9.11 | 4.56 |
| 52 | 22.69 | 19.25 | 15.81 | 8.94 | 4.47 |
| 53 | 22.26 | 18.89 | 15.51 | 8.77 | 4.38 |
| 54 | 21.85 | 18.54 | 15.23 | 8.61 | 4.30 |
| 55 | 21.45 | 18.20 | 14.95 | 8.45 | 4.22 |
| 56 | 21.07 | 17.87 | 14.68 | 8.30 | 4.15 |
| 57 | 20.70 | 17.56 | 14.42 | 8.15 | 4.08 |
| 58 | 20.34 | 17.26 | 14.18 | 8.01 | 4.01 |
| Const's | 1179.70 | 1000.96 | 822.21 | 464.73 | 232.36 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 8 inches Diameter
Whirl $1\frac{1}{16}$ inch Diameter

Ratio Cylinder to Whirl 1 to 7.30
Front Roll Gear 100 Teeth

| Change | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|---------|---------------------|---------------------|--------------------|--------------------|--------------------|
| Gears | Twist | Twist | Twist | Twist | Twist |
| 59 | 19.99 | 16.97 | 13.94 | 7.88 | 3.94 |
| 60 | 19.66 | 16.68 | 13.70 | 7.75 | 3.87 |
| 61 | 19.34 | 16.41 | 13.48 | 7.62 | 3.81 |
| 62 | 19.03 | 16.14 | 13.26 | 7.50 | 3.75 |
| 63 | 18.73 | 15.89 | 13.05 | 7.38 | 3.69 |
| 64 | 18.43 | 15.64 | 12.85 | 7.26 | 3.63 |
| 65 | 18.15 | 15.40 | 12.65 | 7.15 | 3.57 |
| 66 | 17.87 | 15.17 | 12.46 | 7.04 | 3.52 |
| 67 | 17.61 | 14.94 | 12.27 | 6.94 | 3.47 |
| 68 | 17.35 | 14.72 | 12.09 | 6.83 | 3.42 |
| 69 | 17.10 | 14.51 | 11.92 | 6.74 | 3.37 |
| 70 | 16.85 | 14.30 | 11.75 | 6.64 | 3.32 |
| 71 | 16.62 | 14.10 | 11.58 | 6.55 | 3.27 |
| 72 | 16.38 | 13.90 | 11.42 | 6.45 | 3.23 |
| 73 | 16.16 | 13.71 | 11.26 | 6.37 | 3.18 |
| 74 | 15.94 | 13.53 | 11.11 | 6.28 | 3.14 |
| 75 | 15.73 | 13.35 | 10.96 | 6.20 | 3.10 |
| 76 | 15.52 | 13.17 | 10.82 | 6.11 | 3.06 |
| 77 | 15.32 | 13.00 | 10.68 | 6.04 | 3.02 |
| 78 | 15.12 | 12.83 | 10.54 | 5.96 | 2.98 |
| 79 | 14.93 | 12.67 | 10.41 | 5.88 | 2.94 |
| 80 | 14.75 | 12.51 | 10.28 | 5.81 | 2.90 |
| 81 | 14.56 | 12.36 | 10.15 | 5.74 | 2.87 |
| 82 | 14.39 | 12.21 | 10.03 | 5.67 | 2.83 |
| 83 | 14.21 | 12.06 | 9.91 | 5.60 | 2.80 |
| 84 | 14.04 | 11.92 | 9.79 | 5.53 | 2.77 |
| 85 | 13.88 | 11.78 | 9.67 | 5.47 | 2.73 |
| 86 | 13.72 | 11.64 | 9.56 | 5.40 | 2.70 |
| 87 | 13.56 | 11.51 | 9.45 | 5.34 | 2.67 |
| 88 | 13.41 | 11.37 | 9.34 | 5.28 | 2.64 |
| 89 | 13.26 | 11.25 | 9.24 | 5.22 | 2.61 |
| 90 | 13.11 | 11.12 | 9.14 | 5.16 | 2.58 |
| 91 | 12.96 | 11.00 | 9.04 | 5.11 | 2.55 |
| 92 | 12.82 | 10.88 | 8.94 | 5.05 | 2.53 |
| 93 | 12.68 | 10.76 | 8.84 | 5.00 | 2.50 |
| 94 | 12.55 | 10.65 | 8.75 | 4.94 | 2.47 |
| 96 | 12.29 | 10.43 | 8.56 | 4.84 | 2.42 |
| 98 | 12.04 | 10.21 | 8.39 | 4.74 | 2.37 |
| 100 | 11.80 | 10.01 | 8.22 | 4.65 | 2.32 |
| 102 | 11.57 | 9.81 | 8.06 | 4.56 | 2.28 |
| 104 | 11.34 | 9.62 | 7.91 | 4.47 | 2.23 |
| 106 | 11.13 | 9.44 | 7.76 | 4.38 | 2.19 |
| 108 | 10.92 | 9.27 | 7.61 | 4.30 | 2.15 |
| 110 | 10.72 | 9.10 | 7.47 | 4.22 | 2.11 |
| Const's | 1179.70 | 1000.96 | 822.21 | 464.73 | 232.36 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 8 inches Diameter
Whirl $1\frac{1}{8}$ inch Diameter

Ratio Cylinder to Whirl 1 to 7.00
Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15T | 75.41 | 63.99 | 52.56 | 29.71 | 14.85 |
| 16 | 70.70 | 59.99 | 49.28 | 27.85 | 13.93 |
| 17 | 66.54 | 56.46 | 46.38 | 26.21 | 13.11 |
| 18 | 62.85 | 53.32 | 43.80 | 24.76 | 12.38 |
| 19 | 59.54 | 50.52 | 41.50 | 23.45 | 11.73 |
| 20 | 56.56 | 47.99 | 39.42 | 22.28 | 11.14 |
| 21 | 53.87 | 45.71 | 37.54 | 21.22 | 10.61 |
| 22 | 51.42 | 43.63 | 35.84 | 20.26 | 10.13 |
| 23 | 49.18 | 41.73 | 34.28 | 19.38 | 9.69 |
| 24 | 47.13 | 39.99 | 32.85 | 18.57 | 9.28 |
| 25 | 45.25 | 38.39 | 31.54 | 17.82 | 8.91 |
| 26 | 43.51 | 36.92 | 30.32 | 17.14 | 8.57 |
| 27 | 41.90 | 35.55 | 29.20 | 16.50 | 8.25 |
| 28 | 40.40 | 34.28 | 28.16 | 15.92 | 7.96 |
| 29 | 39.01 | 33.10 | 27.19 | 15.37 | 7.68 |
| 30 | 37.71 | 31.99 | 26.28 | 14.85 | 7.43 |
| 31 | 36.49 | 30.96 | 25.43 | 14.38 | 7.19 |
| 32 | 35.35 | 29.99 | 24.64 | 13.93 | 6.96 |
| 33 | 34.28 | 29.09 | 23.89 | 13.50 | 6.75 |
| 34 | 33.27 | 28.23 | 23.19 | 13.11 | 6.55 |
| 35 | 32.32 | 27.42 | 22.53 | 12.73 | 6.37 |
| 36 | 31.42 | 26.66 | 21.90 | 12.38 | 6.19 |
| 37 | 30.57 | 25.94 | 21.31 | 12.04 | 6.02 |
| 38 | 29.77 | 25.26 | 20.75 | 11.73 | 5.86 |
| 39 | 29.01 | 24.61 | 20.22 | 11.43 | 5.71 |
| 40 | 28.38 | 24.00 | 19.71 | 11.14 | 5.57 |
| 41 | 27.59 | 23.41 | 19.23 | 10.87 | 5.43 |
| 42 | 26.93 | 22.85 | 18.77 | 10.61 | 5.31 |
| 43 | 26.31 | 22.32 | 18.33 | 10.36 | 5.18 |
| 44 | 25.71 | 21.81 | 17.92 | 10.12 | 5.06 |
| 45 | 25.14 | 21.33 | 17.52 | 9.90 | 4.95 |
| 46 | 24.59 | 20.87 | 17.14 | 9.69 | 4.84 |
| 47 | 24.07 | 20.42 | 16.77 | 9.48 | 4.74 |
| 48 | 23.57 | 20.00 | 16.43 | 9.28 | 4.64 |
| 49 | 23.09 | 19.59 | 16.09 | 9.09 | 4.55 |
| 50 | 22.62 | 19.20 | 15.77 | 8.91 | 4.46 |
| 51 | 22.18 | 18.82 | 15.46 | 8.74 | 4.37 |
| 52 | 21.75 | 18.46 | 15.16 | 8.57 | 4.28 |
| 53 | 21.34 | 18.11 | 14.88 | 8.41 | 4.20 |
| 54 | 20.95 | 17.77 | 14.60 | 8.25 | 4.13 |
| 55 | 20.57 | 17.45 | 14.33 | 8.10 | 4.05 |
| 56 | 20.20 | 17.14 | 14.08 | 7.96 | 3.98 |
| 57 | 19.85 | 16.84 | 13.83 | 7.82 | 3.91 |
| 58 | 19.50 | 16.55 | 13.59 | 7.68 | 3.84 |
| Const's | 1131.22 | 959.82 | 788.42 | 445.63 | 222.81 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 7.00

Whirl $1\frac{1}{8}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 19.17 | 16.27 | 13.36 | 7.55 | 3.78 |
| 60 | 18.85 | 16.00 | 13.14 | 7.43 | 3.71 |
| 61 | 18.54 | 15.73 | 12.92 | 7.31 | 3.65 |
| 62 | 18.25 | 15.48 | 12.72 | 7.19 | 3.59 |
| 63 | 17.95 | 15.24 | 12.52 | 7.07 | 3.54 |
| 64 | 17.68 | 15.00 | 12.32 | 6.96 | 3.48 |
| 65 | 17.40 | 14.77 | 12.13 | 6.86 | 3.43 |
| 66 | 17.14 | 14.54 | 11.95 | 6.75 | 3.38 |
| 67 | 16.88 | 14.33 | 11.77 | 6.65 | 3.33 |
| 68 | 16.64 | 14.12 | 11.59 | 6.55 | 3.28 |
| 69 | 16.39 | 13.91 | 11.43 | 6.46 | 3.23 |
| 70 | 16.16 | 13.71 | 11.26 | 6.37 | 3.18 |
| 71 | 15.93 | 13.52 | 11.10 | 6.28 | 3.14 |
| 72 | 15.71 | 13.33 | 10.95 | 6.19 | 3.09 |
| 73 | 15.50 | 13.15 | 10.80 | 6.10 | 3.05 |
| 74 | 15.29 | 12.97 | 10.65 | 6.02 | 3.01 |
| 75 | 15.08 | 12.80 | 10.51 | 5.94 | 2.97 |
| 76 | 14.88 | 12.63 | 10.38 | 5.86 | 2.93 |
| 77 | 14.69 | 12.47 | 10.24 | 5.79 | 2.89 |
| 78 | 14.50 | 12.31 | 10.11 | 5.71 | 2.86 |
| 79 | 14.32 | 12.15 | 9.98 | 5.64 | 2.82 |
| 80 | 14.14 | 12.00 | 9.86 | 5.57 | 2.79 |
| 81 | 13.97 | 11.85 | 9.73 | 5.50 | 2.75 |
| 82 | 13.80 | 11.71 | 9.61 | 5.43 | 2.72 |
| 83 | 13.63 | 11.56 | 9.50 | 5.37 | 2.68 |
| 84 | 13.46 | 11.43 | 9.39 | 5.30 | 2.65 |
| 85 | 13.31 | 11.29 | 9.28 | 5.24 | 2.62 |
| 86 | 13.15 | 11.16 | 9.17 | 5.18 | 2.59 |
| 87 | 13.00 | 11.03 | 9.06 | 5.12 | 2.56 |
| 88 | 12.85 | 10.91 | 8.96 | 5.06 | 2.53 |
| 89 | 12.71 | 10.78 | 8.86 | 5.01 | 2.50 |
| 90 | 12.57 | 10.66 | 8.76 | 4.95 | 2.48 |
| 91 | 12.43 | 10.55 | 8.66 | 4.90 | 2.45 |
| 92 | 12.30 | 10.43 | 8.57 | 4.84 | 2.42 |
| 93 | 12.16 | 10.32 | 8.48 | 4.79 | 2.40 |
| 94 | 12.03 | 10.21 | 8.39 | 4.74 | 2.37 |
| 96 | 11.78 | 10.00 | 8.21 | 4.64 | 2.32 |
| 98 | 11.54 | 9.79 | 8.05 | 4.55 | 2.27 |
| 100 | 11.31 | 9.60 | 7.88 | 4.46 | 2.23 |
| 102 | 11.09 | 9.41 | 7.73 | 4.37 | 2.18 |
| 104 | 10.88 | 9.23 | 7.58 | 4.28 | 2.14 |
| 106 | 10.67 | 9.05 | 7.44 | 4.20 | 2.10 |
| 108 | 10.48 | 8.89 | 7.30 | 4.13 | 2.06 |
| 110 | 10.28 | 8.73 | 7.17 | 4.05 | 2.03 |
| Const's | 1131.22 | 959.82 | 788.42 | 445.63 | 222.81 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 5.90

Whirl $1\frac{5}{16}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15T | 63.56 | 53.93 | 44.30 | 25.04 | 12.52 |
| 16 | 59.59 | 50.56 | 41.53 | 23.47 | 11.74 |
| 17 | 56.09 | 47.59 | 39.09 | 22.09 | 11.05 |
| 18 | 52.97 | 44.94 | 36.92 | 20.87 | 10.43 |
| 19 | 50.18 | 42.58 | 34.98 | 19.77 | 9.88 |
| 20 | 47.67 | 40.45 | 33.23 | 18.78 | 9.39 |
| 21 | 45.40 | 38.52 | 31.64 | 17.89 | 8.94 |
| 22 | 43.34 | 36.77 | 30.21 | 17.07 | 8.54 |
| 23 | 41.45 | 35.17 | 28.89 | 16.33 | 8.17 |
| 24 | 39.73 | 33.71 | 27.69 | 15.65 | 7.82 |
| 25 | 38.14 | 32.36 | 26.58 | 15.02 | 7.51 |
| 26 | 36.67 | 31.11 | 25.56 | 14.45 | 7.22 |
| 27 | 35.31 | 29.96 | 24.61 | 13.91 | 6.96 |
| 28 | 34.05 | 28.89 | 23.73 | 13.41 | 6.71 |
| 29 | 32.88 | 27.89 | 22.91 | 12.95 | 6.48 |
| 30 | 31.78 | 26.97 | 22.15 | 12.52 | 6.26 |
| 31 | 29.76 | 26.10 | 21.44 | 12.12 | 6.06 |
| 32 | 29.80 | 25.28 | 20.77 | 11.74 | 5.87 |
| 33 | 28.89 | 24.51 | 20.14 | 11.38 | 5.69 |
| 34 | 28.04 | 23.79 | 19.54 | 11.05 | 5.52 |
| 35 | 27.24 | 23.11 | 18.99 | 10.73 | 5.37 |
| 36 | 26.49 | 22.47 | 18.46 | 10.43 | 5.22 |
| 37 | 25.77 | 21.86 | 17.96 | 10.15 | 5.08 |
| 38 | 25.09 | 21.29 | 17.48 | 9.88 | 4.94 |
| 39 | 24.45 | 20.74 | 17.04 | 9.63 | 4.82 |
| 40 | 23.84 | 20.22 | 16.61 | 9.39 | 4.69 |
| 41 | 23.26 | 19.73 | 16.21 | 9.16 | 4.58 |
| 42 | 22.70 | 19.26 | 15.82 | 8.94 | 4.47 |
| 43 | 22.17 | 18.81 | 15.45 | 8.73 | 4.37 |
| 44 | 21.67 | 18.39 | 15.10 | 8.54 | 4.27 |
| 45 | 21.19 | 17.98 | 14.77 | 8.35 | 4.17 |
| 46 | 20.73 | 17.59 | 14.45 | 8.16 | 4.08 |
| 47 | 20.29 | 17.21 | 14.14 | 7.99 | 4.00 |
| 48 | 19.86 | 16.85 | 13.84 | 7.82 | 3.91 |
| 49 | 19.46 | 16.51 | 13.56 | 7.67 | 3.83 |
| 50 | 19.08 | 16.18 | 13.29 | 7.51 | 3.76 |
| 51 | 18.69 | 15.86 | 13.03 | 7.36 | 3.68 |
| 52 | 18.34 | 15.56 | 12.78 | 7.22 | 3.61 |
| 53 | 17.99 | 15.26 | 12.54 | 7.09 | 3.54 |
| 54 | 17.66 | 14.98 | 12.31 | 6.96 | 3.48 |
| 55 | 17.34 | 14.71 | 12.08 | 6.83 | 3.41 |
| 56 | 17.03 | 14.45 | 11.87 | 6.71 | 3.35 |
| 57 | 16.73 | 14.19 | 11.66 | 6.59 | 3.29 |
| 58 | 16.44 | 13.95 | 11.46 | 6.48 | 3.24 |
| Const's | 953.46 | 808.99 | 664.53 | 375.60 | 187.80 |

TAPE DRIVE

SPINNING TWIST GEAR TABLE

Front Roll 1 inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 5.90

Whirl $1\frac{5}{16}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 | Cyl. 69 Stud 69 |
|-----------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 16.16 | 13.71 | 11.26 | 6.37 | 3.18 |
| 60 | 15.89 | 13.48 | 11.08 | 6.26 | 3.13 |
| 61 | 15.63 | 13.26 | 10.89 | 6.16 | 3.08 |
| 62 | 15.38 | 13.05 | 10.72 | 6.06 | 3.03 |
| 63 | 15.13 | 12.84 | 10.55 | 5.96 | 2.98 |
| 64 | 14.90 | 12.64 | 10.38 | 5.87 | 2.93 |
| 65 | 14.67 | 12.45 | 10.22 | 5.78 | 2.89 |
| 66 | 14.45 | 12.26 | 10.07 | 5.69 | 2.85 |
| 67 | 14.23 | 12.07 | 9.92 | 5.61 | 2.80 |
| 68 | 14.02 | 11.89 | 9.77 | 5.52 | 2.76 |
| 69 | 13.82 | 11.72 | 9.63 | 5.44 | 2.72 |
| 70 | 13.62 | 11.56 | 9.49 | 5.37 | 2.68 |
| 71 | 13.43 | 11.39 | 9.36 | 5.29 | 2.65 |
| 72 | 13.24 | 11.24 | 9.23 | 5.22 | 2.61 |
| 73 | 13.06 | 11.08 | 9.10 | 5.15 | 2.57 |
| 74 | 12.88 | 10.93 | 8.98 | 5.08 | 2.54 |
| 75 | 12.71 | 10.79 | 8.86 | 5.01 | 2.50 |
| 76 | 12.54 | 10.64 | 8.74 | 4.94 | 2.47 |
| 77 | 12.38 | 10.51 | 8.63 | 4.88 | 2.44 |
| 78 | 12.22 | 10.37 | 8.52 | 4.82 | 2.41 |
| 79 | 12.07 | 10.24 | 8.41 | 4.75 | 2.38 |
| 80 | 11.92 | 10.11 | 8.31 | 4.69 | 2.35 |
| 81 | 11.77 | 9.99 | 8.20 | 4.64 | 2.32 |
| 82 | 11.63 | 9.87 | 8.10 | 4.58 | 2.29 |
| 83 | 11.49 | 9.74 | 8.01 | 4.53 | 2.26 |
| 84 | 11.35 | 9.63 | 7.91 | 4.47 | 2.24 |
| 85 | 11.21 | 9.52 | 7.82 | 4.42 | 2.21 |
| 86 | 11.09 | 9.41 | 7.73 | 4.37 | 2.18 |
| 87 | 10.96 | 9.30 | 7.64 | 4.32 | 2.16 |
| 88 | 10.83 | 9.19 | 7.55 | 4.27 | 2.13 |
| 89 | 10.71 | 9.09 | 7.47 | 4.22 | 2.11 |
| 90 | 10.59 | 8.99 | 7.38 | 4.17 | 2.09 |
| 91 | 10.48 | 8.89 | 7.30 | 4.13 | 2.06 |
| 92 | 10.36 | 8.79 | 7.22 | 4.08 | 2.04 |
| 93 | 10.25 | 8.70 | 7.15 | 4.04 | 2.02 |
| 94 | 10.14 | 8.60 | 7.07 | 4.00 | 2.00 |
| 96 | 9.93 | 8.43 | 6.92 | 3.91 | 1.96 |
| 98 | 9.73 | 8.25 | 6.78 | 3.83 | 1.92 |
| 100 | 9.53 | 8.09 | 6.64 | 3.76 | 1.88 |
| 102 | 9.35 | 7.93 | 6.51 | 3.68 | 1.84 |
| 104 | 9.17 | 7.78 | 6.39 | 3.61 | 1.81 |
| 106 | 8.99 | 7.63 | 6.27 | 3.54 | 1.77 |
| 108 | 8.83 | 7.49 | 6.15 | 3.48 | 1.74 |
| 110 | 8.67 | 7.35 | 6.04 | 3.41 | 1.71 |
| Const's | 953.46 | 808.99 | 664.53 | 373.60 | 187.80 |

PRODUCTION TABLES

The production of a ring spinning frame depends on several varying factors, viz: the character of the product required, the length and grade of staple, the amount of twist imparted to the yarn and the working conditions of the frame.

The figures tabulated in the following pages are based on data obtained from several conservatively operated mills and consequently may be used as a basis for estimating productions of frames working under like conditions.

The twists per inch are based on the following twist multipliers:

WARP YARNS

| | | | | | | | | | |
|--|---|---|---|---|---|---|---|------|-------|
| 4.75 x sq. root of number of yarn from 4's to 35's inclusive | | | | | | | | | |
| 4.60 x | " | " | " | " | " | " | " | 36's | 40's |
| 4.50 x | " | " | " | " | " | " | " | 41's | 75's |
| 4.25 x | " | " | " | " | " | " | " | 76's | 100's |

FILLING YARNS

| | | | | | | | | | |
|--|---|---|---|---|---|---|---|------|-------|
| 3.50 x sq. root of number of yarn from 4's to 27's inclusive | | | | | | | | | |
| 3.40 x | " | " | " | " | " | " | " | 27's | 34's |
| 3.25 x | " | " | " | " | " | " | " | 34's | 60's |
| 3.20 x | " | " | " | " | " | " | " | 60's | 100's |

HOSIERY YARNS

| | | | | | | | | | |
|--|---|---|---|---|---|---|---|------|------|
| 3.00 x sq. root of number of yarn from 2's to 25's inclusive | | | | | | | | | |
| 2.75 x | " | " | " | " | " | " | " | 26's | 36's |
| 2.50 x | " | " | " | " | " | " | " | 37's | 50's |

PRODUCTION TABLE OF RING WARP YARN

Frames Without Separators

1 inch Diameter Front Roll

| No. of Yarn | Size of Spindle | Gauge of Frame | Dia. of Ring | Length of Traverse | Twist Per Inch | Rev. of Front Roll Per Minute | Rev. of Spindles per Minute | Hanks per Spindle per 10 Hours | Pounds per Spindle per Week-60 hours | Pounds per Spindle per Week of 54 hours | Pounds per Spindle per Week of 48 Hours | Length of Staple | Allowance for Stoppage |
|-------------|-----------------|----------------|--------------|--------------------|----------------|-------------------------------|-----------------------------|--------------------------------|--------------------------------------|---|---|------------------|------------------------|
| 4 | Large Gravity | | | | 9.5 | 171 | 5100 | 9.38 | 14.07 | 12.66 | 11.26 | | |
| 6 | | | | 8" | 10.6 | 166 | 5525 | 9.11 | 10.93 | 9.84 | 8.74 | | |
| 6 | | 4 1/2" | 2 1/4" | | 11.6 | 164 | 6000 | 9.00 | 9.00 | 8.10 | 7.20 | | |
| 7 | | | | | 12.6 | 165 | 6550 | 9.05 | 7.76 | 6.98 | 6.21 | | |
| 8 | | | | | 13.4 | 166 | 7000 | 9.11 | 6.83 | 6.15 | 5.46 | | |
| 9 | MEDIUM No. 1 | 4" | | | 14.3 | 162 | 7300 | 8.89 | 5.93 | 5.34 | 4.74 | 1' | 12% |
| 10 | | | 2 1/8" | 7 3/4" | 15.0 | 159 | 7500 | 8.92 | 5.35 | 4.82 | 4.28 | 3/8" to 1' | |
| 11 | | | | | 15.7 | 156 | 7700 | 8.75 | 4.77 | 4.29 | 3.82 | | |
| 12 | | | | | 16.4 | 152 | 7850 | 8.53 | 4.26 | 3.84 | 3.41 | | |
| 13 | | | | | 17.1 | 149 | 8000 | 8.36 | 3.86 | 3.47 | 3.08 | | |
| 14 | STANDARD No. 1 | 3 3/4" | 2" | 7 1/2" | 17.8 | 147 | 8250 | 8.25 | 3.54 | 3.18 | 2.83 | | |
| 15 | | | | | 18.4 | 143 | 8300 | 8.03 | 3.21 | 2.89 | 2.57 | | 10% |
| 16 | | | | | 19.0 | 142 | 8500 | 7.97 | 2.99 | 2.69 | 2.39 | | |
| 17 | | | | | 19.6 | 139 | 8600 | 7.80 | 2.75 | 2.48 | 2.20 | | |
| 18 | | | | | 20.1 | 138 | 8700 | 7.75 | 2.58 | 2.32 | 2.06 | | |
| 19 | | | | | 20.7 | 135 | 8800 | 7.58 | 2.34 | 2.15 | 1.91 | | |
| 20 | | | | 7" | 21.2 | 134 | 8950 | 7.50 | 2.25 | 2.02 | 1.80 | | |
| 21 | | 3 1/2" | | | 21.7 | 132 | 9000 | 7.49 | 2.14 | 1.93 | 1.71 | | |
| 22 | | | | | 22.2 | 129 | 9050 | 7.32 | 1.99 | 1.79 | 1.59 | | |
| 23 | | | 1 7/8" | | 22.7 | 127 | 9100 | 7.21 | 1.88 | 1.69 | 1.50 | | |
| 24 | | | | | 23.2 | 126 | 9200 | 7.15 | 1.79 | 1.61 | 1.43 | | |
| 25 | | | | | 23.7 | 124 | 9250 | 7.03 | 1.69 | 1.52 | 1.35 | 1' to 1 1/4" | 9% |
| 26 | | | | | 24.2 | 122 | 9300 | 6.92 | 1.60 | 1.44 | 1.28 | | |
| 27 | | | | | 24.7 | 120 | 9325 | 6.80 | 1.51 | 1.36 | 1.21 | | |
| 28 | | | | | 25.1 | 119 | 9425 | 6.75 | 1.44 | 1.30 | 1.16 | 1' to 1 1/4" | |
| 29 | | | | | 25.6 | 117 | 9450 | 6.64 | 1.37 | 1.24 | 1.10 | | |
| 30 | | | | | 26.0 | 116 | 9525 | 6.65 | 1.33 | 1.20 | 1.06 | | |
| 31 | | | | | 26.4 | 115 | 9600 | 6.59 | 1.27 | 1.15 | 1.02 | | |
| 32 | | | | 6 1/2" | 26.9 | 113 | 9600 | 6.48 | 1.21 | 1.09 | .97 | | |
| 33 | | | 1 3/4" | | 27.3 | 112 | 9600 | 6.42 | 1.17 | 1.05 | .93 | | |
| 34 | | | | | 27.4 | 111 | 9600 | 6.36 | 1.12 | 1.01 | .90 | | |
| 35 | | 3 1/4" | | | 27.5 | 111 | 9600 | 6.36 | 1.09 | .98 | .87 | | 8% |
| 36 | | | | | 27.6 | 110 | 9600 | 6.31 | 1.05 | .95 | .84 | | |
| 37 | | | | | 27.8 | 110 | 9600 | 6.31 | 1.02 | .92 | .82 | | |
| 38 | | | | | 28.0 | 109 | 9600 | 6.25 | .99 | .89 | .79 | | |
| 39 | | | | | 28.4 | 108 | 9700 | 6.19 | .95 | .86 | .76 | | |
| 40 | | | 1 5/8" | | 28.5 | 108 | 9700 | 6.26 | .94 | .84 | .75 | | |
| 41 | | | | | 28.8 | 107 | 9700 | 6.20 | .91 | .82 | .73 | | |
| 42 | | | | | 29.2 | 105 | 9700 | 6.09 | .87 | .78 | .70 | | |
| 43 | | | | | 29.5 | 104 | 9725 | 6.03 | .84 | .76 | .67 | | |
| 44 | | | | | 29.7 | 104 | 9700 | 6.03 | .82 | .74 | .66 | | |
| 45 | | | | | 30.2 | 102 | 9750 | 5.91 | .79 | .71 | .63 | | |
| 46 | | | | | 30.5 | 102 | 9775 | 5.91 | .77 | .69 | .62 | | 7% |
| 47 | | | | | 30.9 | 100 | 9700 | 5.80 | .74 | .67 | .59 | | |
| 48 | | 3" | 1 1/2" | 6" | 31.2 | 99 | 9700 | 5.74 | .72 | .64 | .57 | | |
| 49 | | | | | 31.5 | 98 | 9700 | 5.68 | .70 | .63 | .56 | | |
| 50 | | | | | 31.8 | 97 | 9700 | 5.69 | .68 | .61 | .55 | | |
| 55 | | | | | 33.4 | 92 | 9750 | 5.39 | .59 | .53 | .47 | | 6% |
| 60 | | | | | 34.8 | 89 | 9775 | 5.21 | .52 | .46 | .41 | | |
| 65 | | | | | 36.3 | 84 | 9625 | 4.98 | .46 | .41 | .37 | | |
| 70 | | | | | 37.7 | 80 | 9525 | 4.74 | .41 | .37 | .32 | | |
| 75 | | | | | 39.0 | 75 | 9300 | 4.49 | .36 | .32 | .29 | | |
| 80 | | 2 3/4" | 1 3/8" | | 39.1 | 74 | 9200 | 4.39 | .33 | .30 | .26 | | 5% |
| 85 | | | | | 39.2 | 74 | 9200 | 4.48 | .32 | .28 | .25 | | |
| 90 | | | | | 40.3 | 72 | 9100 | 4.35 | .29 | .26 | .23 | | 3% |
| 95 | | | | | 41.2 | 69 | 9000 | 4.17 | .26 | .24 | .21 | | |
| 100 | | | | | 42.5 | 65 | 8800 | 3.93 | .24 | .21 | .19 | | |

PRODUCTION TABLE OF RING FILLING YARN

Frames Without Separators

1 inch Diameter Front Roll

| No. of Yarn | Size of Spindle | Gauge of Frame | Dia. of Ring | Length of Traverse | Twist Per Inch | Rev. of Front Roll Per Minute | Rev. of Spindles per Minute | Hanks per Spindle per 10 Hours | Pounds per Spindle per 60 hours | Pounds per Spindle per Week of 64 hours | Pounds per Spindle per Week of 48 hours | Staple | Allowance for Stoppage |
|-------------|-----------------|-------------------------------|-------------------------------|-------------------------------|----------------|-------------------------------|-----------------------------|--------------------------------|---------------------------------|---|---|--------|------------------------|
| 4 | Large Gravity | | | | 7.0 | 214 | 4700 | 10.68 | 16.03 | 14.42 | 12.82 | | |
| 5 | | | | | 7.8 | 196 | 4800 | 9.77 | 11.72 | 10.55 | 9.38 | | |
| 6 | | 31 ₄ " | 1 ₅ ₈ " | 8" | 8.6 | 192 | 5200 | 9.57 | 9.57 | 8.61 | 7.65 | | |
| 7 | | | | | 9.3 | 188 | 5500 | 9.37 | 8.04 | 7.24 | 6.43 | | |
| 8 | | | | | 9.9 | 186 | 5800 | 9.27 | 6.95 | 6.25 | 5.56 | | |
| 9 | MEDIUM No. 1 | | | | 10.5 | 182 | 6000 | 9.08 | 6.05 | 5.45 | 4.84 | | |
| 10 | | | | | 11.1 | 178 | 6200 | 9.09 | 5.45 | 4.90 | 4.36 | | |
| 11 | | | | | 11.6 | 174 | 6350 | 8.88 | 4.84 | 4.36 | 3.87 | | |
| 12 | | | 1 ₁ ₂ " | | 12.1 | 172 | 6550 | 8.78 | 4.39 | 3.95 | 3.51 | | 18% |
| 13 | | | | | 12.6 | 172 | 6800 | 8.78 | 4.05 | 3.65 | 3.24 | | |
| 14 | | | to | | 13.1 | 168 | 6900 | 8.58 | 3.68 | 3.31 | 2.94 | | |
| 15 | | | | 7" | 13.6 | 165 | 7050 | 8.73 | 3.49 | 3.14 | 2.78 | | |
| 16 | | 3" | 1 ₅ ₈ " | | 14.0 | 162 | 7150 | 8.57 | 3.22 | 2.90 | 2.58 | | |
| 17 | | | | | 14.4 | 161 | 7300 | 8.51 | 3.00 | 2.70 | 2.40 | | 15% |
| 18 | | | | | 14.9 | 158 | 7400 | 8.36 | 2.79 | 2.51 | 2.23 | | |
| 19 | STANDARD No. 1 | | | | 15.3 | 156 | 7500 | 8.25 | 2.60 | 2.34 | 2.08 | | |
| 20 | | | | | 15.7 | 154 | 7600 | 8.45 | 2.53 | 2.28 | 2.02 | | |
| 21 | | | | | 16.0 | 154 | 7750 | 8.45 | 2.41 | 2.17 | 1.93 | | |
| 22 | | | | | 16.4 | 154 | 7925 | 8.45 | 2.30 | 2.07 | 1.84 | | 12% |
| 23 | | | | | 16.8 | 152 | 8025 | 8.34 | 2.16 | 1.94 | 1.72 | | |
| 24 | | | | | 17.2 | 150 | 8100 | 8.23 | 2.06 | 1.85 | 1.64 | | |
| 25 | | | | | 17.5 | 149 | 8200 | 8.35 | 2.00 | 1.80 | 1.60 | | |
| 26 | | | | | 17.9 | 148 | 8300 | 8.30 | 1.91 | 1.71 | 1.52 | | |
| 27 | | | | | 17.7 | 148 | 8225 | 8.30 | 1.84 | 1.66 | 1.47 | | 10% |
| 28 | | | | | 18.0 | 146 | 8250 | 8.22 | 1.72 | 1.55 | 1.37 | | |
| 29 | STANDARD No. 1 | | | | 18.3 | 144 | 8275 | 8.07 | 1.67 | 1.50 | 1.33 | | |
| 30 | | | 1 ₃ ₈ " | | 18.4 | 142 | 8200 | 8.05 | 1.61 | 1.44 | 1.28 | | |
| 31 | | | | | 18.6 | 141 | 8225 | 7.99 | 1.54 | 1.38 | 1.23 | | |
| 32 | | | | | 18.7 | 140 | 8225 | 7.93 | 1.48 | 1.33 | 1.18 | | 9% |
| 33 | | | | | 18.9 | 138 | 8200 | 7.82 | 1.41 | 1.26 | 1.12 | | |
| 34 | | | | | 19.0 | 136 | 8125 | 7.71 | 1.36 | 1.22 | 1.08 | | |
| 35 | | | | | 19.2 | 134 | 8175 | 7.69 | 1.32 | 1.18 | 1.05 | | |
| 36 | | | | | 19.5 | 132 | 8175 | 7.57 | 1.26 | 1.13 | 1.00 | | |
| 37 | | 2 ₃ ₄ " | | | 19.8 | 130 | 8100 | 7.46 | 1.21 | 1.08 | .96 | | |
| 38 | | | | | 20.0 | 128 | 8075 | 7.34 | 1.16 | 1.04 | .92 | | 8% |
| 39 | STANDARD No. 1 | | | 6 ₁ ₂ " | 20.3 | 126 | 8050 | 7.23 | 1.11 | .99 | .88 | | |
| 40 | | | | | 20.6 | 124 | 8025 | 7.19 | 1.08 | .97 | .86 | | |
| 41 | | | | | 20.8 | 122 | 7975 | 7.07 | 1.03 | .92 | .82 | | |
| 42 | | | | | 21.1 | 120 | 7950 | 6.96 | .99 | .89 | .79 | | |
| 43 | | | | | 21.3 | 118 | 7900 | 6.84 | .95 | .85 | .76 | | |
| 44 | | | | | 21.5 | 117 | 7900 | 6.78 | .93 | .83 | .74 | | |
| 45 | | | | | 21.8 | 115 | 7875 | 6.67 | .89 | .80 | .71 | | |
| 46 | | | | | 22.0 | 114 | 7875 | 6.61 | .86 | .77 | .68 | | 7% |
| 47 | | | | | 22.2 | 113 | 7875 | 6.55 | .83 | .74 | .66 | | |
| 48 | | | | | 22.5 | 112 | 7875 | 6.49 | .81 | .72 | .64 | | |
| 49 | STANDARD No. 1 | | | | 22.7 | 111 | 7850 | 6.43 | .78 | .70 | .62 | | |
| 50 | | | | | 23.0 | 109 | 7850 | 6.38 | .76 | .68 | .60 | | 6% |
| 55 | | | 1 ₁ ₄ " | | 24.1 | 103 | 7800 | 6.03 | .65 | .58 | .52 | | |
| 60 | | | | | 25.1 | 99 | 7825 | 5.86 | .58 | .52 | .46 | | |
| 65 | | | | | 25.8 | 97 | 7850 | 5.74 | .53 | .47 | .42 | | |
| 70 | | | | | 26.7 | 93 | 7825 | 5.50 | .47 | .42 | .37 | | 6% |
| 75 | | | | | 27.7 | 90 | 7825 | 5.32 | .42 | .37 | .33 | | |
| 80 | | | | 6" | 28.6 | 87 | 7825 | 5.22 | .39 | .35 | .31 | | |
| 85 | | | | | 29.8 | 84 | 7800 | 5.04 | .35 | .31 | .28 | | 3% |
| 90 | | | | | 30.4 | 81 | 7725 | 4.86 | .32 | .29 | .25 | | |
| 95 | STANDARD No. 1 | | | | 31.2 | 78 | 7675 | 4.75 | .30 | .27 | .24 | | 2% |
| 100 | | | | | 32.0 | 76 | 7650 | 4.63 | .27 | .24 | .21 | | |

PRODUCTION TABLE OF RING HOSIERY YARNS

Frames Without Separators

1 inch Diameter Front Roll

| No. of Yarn | Size of Spindle | Gauge of Frame | Dia. of Ring | Length of Traverse | Twist Per Inch | Rev. of Front Roll Per Minute | Rev. of Spindles per Minute | Hanks per Spindle per 10 Hours | Pounds per Spindle per Week of 60 hours | Pounds per Spindle per Week of 54 hours | Pounds per Spindle per Week of 48 Hours | Staple | Allowance for Stoppage |
|-------------|-----------------|-------------------|-------------------|--------------------|----------------|-------------------------------|-----------------------------|--------------------------------|---|---|---|-------------------|------------------------|
| 2 | Large Gravity | | | | 4.2 | 220 | 2900 | 10.98 | 32.94 | 29.65 | 26.35 | | |
| 3 | | | | | 5.2 | 214 | 3500 | 10.68 | 21.36 | 19.22 | 17.08 | | |
| 4 | | | | | 6.0 | 208 | 3925 | 10.38 | 15.57 | 14.01 | 12.45 | | |
| 5 | | 3 $\frac{3}{4}$ " | 2 $\frac{1}{4}$ " | 8" | 6.7 | 202 | 4250 | 10.08 | 12.10 | 10.89 | 9.68 | | |
| 6 | | | | | 7.4 | 196 | 4550 | 9.78 | 9.78 | 8.80 | 7.82 | | |
| 7 | | | | | 7.9 | 190 | 4700 | 9.49 | 8.14 | 7.32 | 6.51 | | 20% |
| 8 | | | | | 8.5 | 185 | 4950 | 9.23 | 6.92 | 6.23 | 5.54 | | |
| 9 | | | | | 9.0 | 181 | 5125 | 9.04 | 6.03 | 5.43 | 4.82 | 7 $\frac{7}{8}$ " | |
| 10 | MEDIUM No. 1 | | | | 9.5 | 177 | 5275 | 9.05 | 5.43 | 4.89 | 4.34 | to | |
| 11 | | | | | 9.9 | 173 | 5375 | 8.85 | 4.82 | 4.34 | 3.85 | 1" | |
| 12 | | | 2" | | 10.4 | 170 | 5550 | 8.70 | 4.35 | 3.91 | 3.48 | | 18% |
| 13 | | | | | 10.8 | 168 | 5700 | 8.60 | 3.97 | 3.57 | 3.18 | | |
| 14 | | | | | 11.2 | 166 | 5850 | 8.50 | 3.64 | 3.27 | 2.91 | | |
| 15 | | | | | 11.6 | 164 | 5925 | 8.69 | 3.48 | 3.13 | 2.78 | | |
| 16 | | 3 $\frac{1}{2}$ " | | 7" | 12.0 | 162 | 6100 | 8.59 | 3.24 | 2.92 | 2.59 | | |
| 17 | | | | | 12.4 | 160 | 6225 | 8.48 | 2.99 | 2.69 | 2.39 | | 15% |
| 18 | STANDARD No. 1 | | | | 12.7 | 158 | 6300 | 8.37 | 2.79 | 2.51 | 2.23 | | |
| 19 | | | | | 13.1 | 156 | 6425 | 8.26 | 2.61 | 2.35 | 2.09 | | |
| 20 | | | | | 13.4 | 154 | 6500 | 8.45 | 2.53 | 2.28 | 2.05 | | |
| 21 | | | | | 13.7 | 153 | 6600 | 8.40 | 2.40 | 2.16 | 1.92 | | |
| 22 | | | | | 14.1 | 152 | 6725 | 8.34 | 2.27 | 2.04 | 1.82 | | 12% |
| 23 | | | 1 $\frac{7}{8}$ " | | 14.4 | 150 | 6800 | 8.23 | 2.15 | 1.93 | 1.72 | | |
| 24 | | | | | 14.7 | 148 | 6825 | 8.12 | 2.06 | 1.85 | 1.65 | | |
| 25 | | | | | 15.0 | 146 | 6875 | 8.20 | 1.97 | 1.77 | 1.58 | | |
| 26 | | | | | 14.0 | 145 | 6375 | 8.14 | 1.88 | 1.69 | 1.50 | 1" | |
| 27 | | | | | 14.3 | 144 | 6475 | 8.09 | 1.80 | 1.62 | 1.44 | to | 10% |
| 28 | | | | | 14.5 | 143 | 6500 | 8.03 | 1.72 | 1.55 | 1.38 | 1 $\frac{1}{4}$ " | |
| 29 | | | | | 14.8 | 142 | 6600 | 7.97 | 1.65 | 1.48 | 1.32 | | |
| 30 | | | | | 15.1 | 140 | 6650 | 7.95 | 1.59 | 1.43 | 1.27 | | |
| 31 | | | | | 15.3 | 138 | 6625 | 7.84 | 1.52 | 1.37 | 1.22 | | |
| 32 | | | | | 15.6 | 136 | 6675 | 7.72 | 1.45 | 1.30 | 1.16 | | 9% |
| 33 | | | | | 15.8 | 134 | 6650 | 7.61 | 1.38 | 1.24 | 1.10 | | |
| 34 | | | | 6 $\frac{1}{2}$ " | 16.0 | 132 | 6625 | 7.49 | 1.32 | 1.19 | 1.06 | | |
| 35 | | 3 $\frac{1}{4}$ " | 1 $\frac{3}{4}$ " | | 16.3 | 130 | 6650 | 7.46 | 1.28 | 1.15 | 1.02 | | |
| 36 | | | | | 16.5 | 128 | 6625 | 7.35 | 1.22 | 1.10 | .98 | | |
| 37 | | | | | 15.2 | 127 | 6075 | 7.29 | 1.17 | 1.05 | .94 | | 8% |
| 38 | | | | | 15.4 | 126 | 6100 | 7.23 | 1.14 | 1.03 | .91 | | |
| 39 | | | | | 15.6 | 125 | 6125 | 7.18 | 1.10 | .99 | .88 | | |
| 40 | | | | | 15.8 | 124 | 6150 | 7.19 | 1.08 | .97 | .86 | | |
| 41 | | | | | 16.0 | 123 | 6175 | 7.13 | 1.04 | .94 | .83 | | |
| 42 | | | | | 16.2 | 122 | 6200 | 7.08 | 1.01 | .91 | .81 | 1 $\frac{1}{8}$ " | |
| 43 | | | | | 16.4 | 121 | 6225 | 7.02 | .98 | .88 | .78 | to | |
| 44 | | | | | 16.6 | 120 | 6250 | 6.96 | .95 | .85 | .76 | 1 $\frac{1}{2}$ " | |
| 45 | | 3" | 1 $\frac{1}{2}$ " | | 16.8 | 119 | 6275 | 6.90 | .92 | .83 | .74 | | 7% |
| 46 | | | | | 17.0 | 118 | 6300 | 6.84 | .89 | .80 | .71 | | |
| 47 | | | | | 17.1 | 117 | 6300 | 6.79 | .87 | .78 | .70 | | |
| 48 | | | | | 17.3 | 116 | 6300 | 6.73 | .84 | .76 | .67 | | |
| 49 | | | | | 17.5 | 115 | 6325 | 6.67 | .82 | .74 | .66 | | |
| 50 | | | | | 17.7 | 114 | 6350 | 6.61 | .79 | .71 | .63 | | |

DRAPER'S TABLE

Of Breaking Weight in Pounds per Skein of

AMERICAN WARP YARN

| 120 Yds. Weight Grains | Number of Yarn | Carded Yarn Breaking Weight | Combed Yarn Breaking Weight | 120 Yds. Weight Grains | Number of Yarn | Carded Yarn Breaking Weight | Combed Yarn Breaking Weight |
|------------------------------|----------------------|--------------------------------------|--------------------------------------|------------------------------|----------------------|--------------------------------------|--------------------------------------|
| 1000 | 1 | | | 20 | 51 | 37 | 47 |
| 500 | 2 | | | 19 | 52 | 36 | 46 |
| 333 | 3 | 530 | 863 | 19 | 53 | 36 | 45 |
| 250 | 4 | 410 | 646 | 19 | 54 | 35 | 44 |
| 200 | 5 | 330 | 516 | 18 | 55 | 34 | 43 |
| 167 | 6 | 275 | 429 | 18 | 56 | 34 | 42 |
| 143 | 7 | 238 | 367 | 18 | 57 | 33 | 42 |
| 125 | 8 | 209 | 321 | 17 | 58 | 33 | 41 |
| 111 | 9 | 187 | 285 | 17 | 59 | 32 | 40 |
| 100 | 10 | 169 | 256 | 17 | 60 | 32 | 39 |
| 91 | 11 | 154 | 232 | 16 | 61 | 31 | 39 |
| 83 | 12 | 142 | 213 | 16 | 62 | 31 | 38 |
| 77 | 13 | 132 | 196 | 16 | 63 | 30 | 37 |
| 71 | 14 | 123 | 182 | 16 | 64 | 30 | 37 |
| 67 | 15 | 115 | 169 | 15 | 65 | 30 | 36 |
| 63 | 16 | 108 | 158 | 15 | 66 | 29 | 35 |
| 59 | 17 | 103 | 149 | 15 | 67 | 29 | 35 |
| 56 | 18 | 97 | 140 | 15 | 68 | 29 | 34 |
| 53 | 19 | 93 | 133 | 15 | 69 | 28 | 34 |
| 50 | 20 | 88 | 126 | 14 | 70 | 28 | 33 |
| 48 | 21 | 84 | 120 | 14 | 71 | 27 | 33 |
| 46 | 22 | 80 | 114 | 14 | 72 | 27 | 32 |
| 44 | 23 | 76 | 109 | 14 | 73 | 27 | 32 |
| 42 | 24 | 72 | 104 | 14 | 74 | 27 | 31 |
| 40 | 25 | 69 | 100 | 13 | 75 | 26 | 31 |
| 39 | 26 | 66 | 96 | 13 | 76 | 26 | 30 |
| 37 | 27 | 64 | 92 | 13 | 77 | 26 | 30 |
| 36 | 28 | 61 | 89 | 13 | 78 | 25 | 29 |
| 35 | 29 | 59 | 86 | 13 | 79 | 25 | 29 |
| 33 | 30 | 57 | 83 | 13 | 80 | 25 | 28 |
| 32 | 31 | 56 | 80 | 12 | 81 | 24 | 28 |
| 31 | 32 | 54 | 77 | 12 | 82 | 24 | 28 |
| 30 | 33 | 53 | 75 | 12 | 83 | 24 | 27 |
| 29 | 34 | 51 | 72 | 12 | 84 | 23 | 27 |
| 29 | 35 | 50 | 70 | 12 | 85 | 23 | 27 |
| 28 | 36 | 49 | 68 | 12 | 86 | 23 | 26 |
| 27 | 37 | 48 | 66 | 12 | 87 | 23 | 26 |
| 26 | 38 | 47 | 64 | 11 | 88 | 22 | 26 |
| 26 | 39 | 46 | 63 | 11 | 89 | 22 | 25 |
| 25 | 40 | 45 | 61 | 11 | 90 | 22 | 25 |
| 24 | 41 | 44 | 59 | 11 | 91 | 22 | 25 |
| 24 | 42 | 43 | 58 | 11 | 92 | 22 | 24 |
| 23 | 43 | 42 | 56 | 11 | 93 | 21 | 24 |
| 23 | 44 | 41 | 55 | 11 | 94 | 21 | 24 |
| 22 | 45 | 41 | 54 | 11 | 95 | 21 | 23 |
| 22 | 46 | 40 | 53 | 10 | 96 | 21 | 23 |
| 21 | 47 | 39 | 51 | 10 | 97 | 21 | 23 |
| 21 | 48 | 39 | 50 | 10 | 98 | 20 | 23 |
| 20 | 49 | 38 | 49 | 10 | 99 | 20 | 22 |
| 20 | 50 | 37 | 48 | 10 | 100 | 20 | 22 |

CARE OF SPINNING FRAMES

The **proper care of machinery** in the spinning department of a cotton mill is an important consideration, and the smallest details should not be overlooked, if good quality and maximum production is desired. Systematic care in keeping the frames clean and in proper working order will repay the spinner, as good results cannot be had if the frames are neglected and allowed to get out of repair. Periodical attention should be given to the oiling and cleaning of the rolls, both top and bottom, the spindles, lifting rods and all bearings. The frames when first installed should be accurately levelled, and this condition should be maintained by frequent inspections and releveled whenever found necessary.

SPINDLES

New frames should have their spindles banded and run empty for 12 to 24 hours before they are set to the rings. New spindles should be oiled every other day for the first week. Then twice each week for two or three weeks. After which every two weeks will be sufficient.

In setting spindles to rings it is customary to use a bobbin with a wood plug attached which should be evenly balanced to avoid vibration. This plug should be about 1-16 inch smaller than the inside of ring. Some spindle setters place the ring rail at the middle of the bobbin when setting spindles so that any variation between top and bottom will be divided.

A more accurate method is to set the spindles to the rings at the bottom of the bobbin. Then run the rail to the top of the bobbin. Any spindle not found in the center of the ring will now need papering. A good smooth paper should be used, as a coarse surfaced paper will absorb oil and soon become soft, allowing spindle base to lean and spindle become out of center. By running the rail up and down three or four times, and repapering, spindles can be made to run in the center of the ring from bottom to top. Guide wires should be set so that the point of the set will touch the back of the opening on the inside. If guides are worn or grooved they should be replaced or made perfectly smooth on the inside. This is a point that is often overlooked in overhauling. Vibrating spindles should be examined very closely. As there are several things that will cause this fault, such as bad bobbin, crooked spindle blade or a worn or dry bolster.

CLEANING

For medium and fine work the deck boards and creels should be dusted at least once a day; the accumulation of lint and dust about the skewer steps and top holes should be removed every other day; the thread boards blocked off every hour, and also thoroughly wiped with waste twice a day. The separators and ring rails should be brushed off every other day; the bolster rails wiped with waste twice daily. The bottom rolls should be wiped with waste twice a week. The front top-rolls should be cleaned daily while the frame is running, if desired, by wiping the leather covers with waste dipped in a half and half mixture of alcohol and water. The back and middle rolls should be treated in the same manner, but only once a week. The top-clearers should be picked four times daily, and scavenger rolls as often as necessary. The spindles should be taken from the frame twice a year, the dirty oil removed and all parts of the spindle thoroughly cleaned before refitting in frame. All remaining parts of frame should have daily brushings, excepting the back weights where one brushing a week would be sufficient.

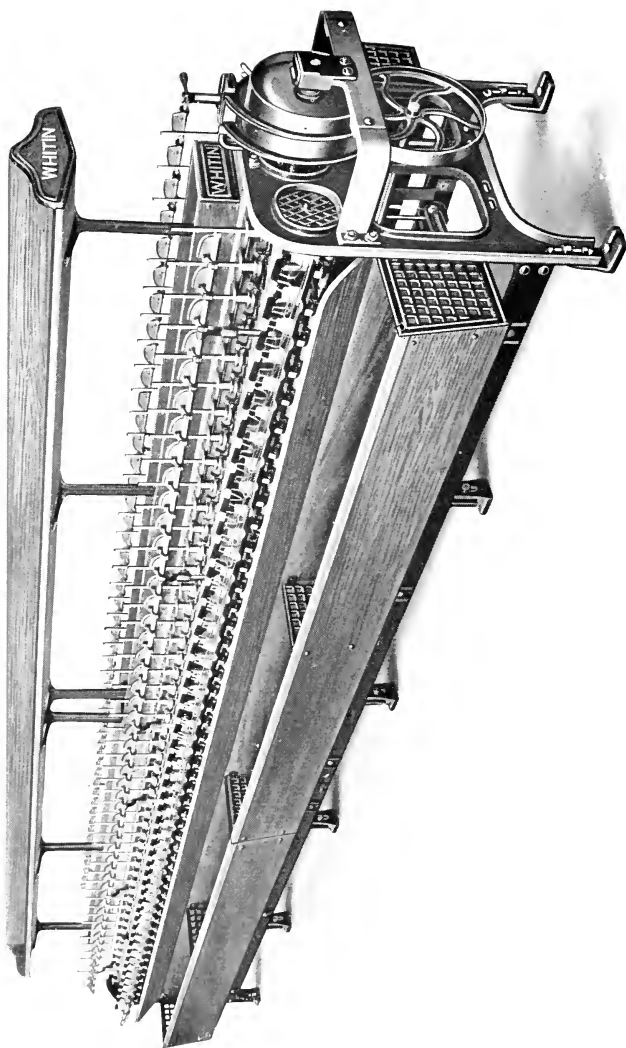
OILING.

The loose pulley, cylinder bearings, head end gearing and top front rolls should be oiled daily; the steel roll bearings twice a day; for the back and middle top-roll end bearings and builder motion weekly oiling will be sufficient; saddle bearings twice a week. The spindles should be oiled every two weeks, although it would not be amiss to put in a little fresh oil every week.

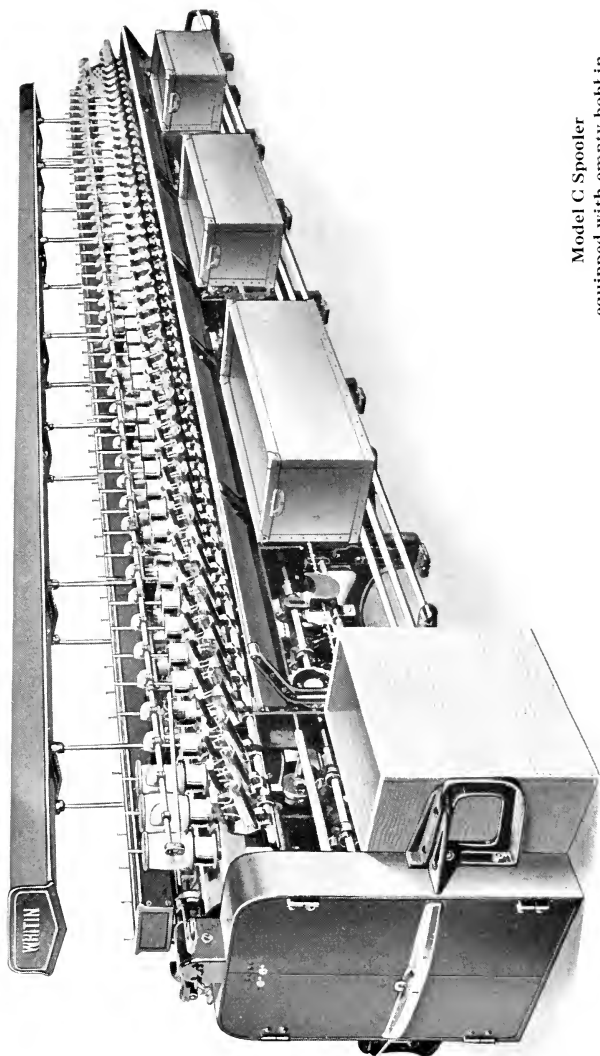
BOBBINS.

Badly fitted bobbins and poor oil are the causes of considerable trouble, therefore the greatest care should be exercised in the selection of both, otherwise good and satisfactory results cannot be obtained.

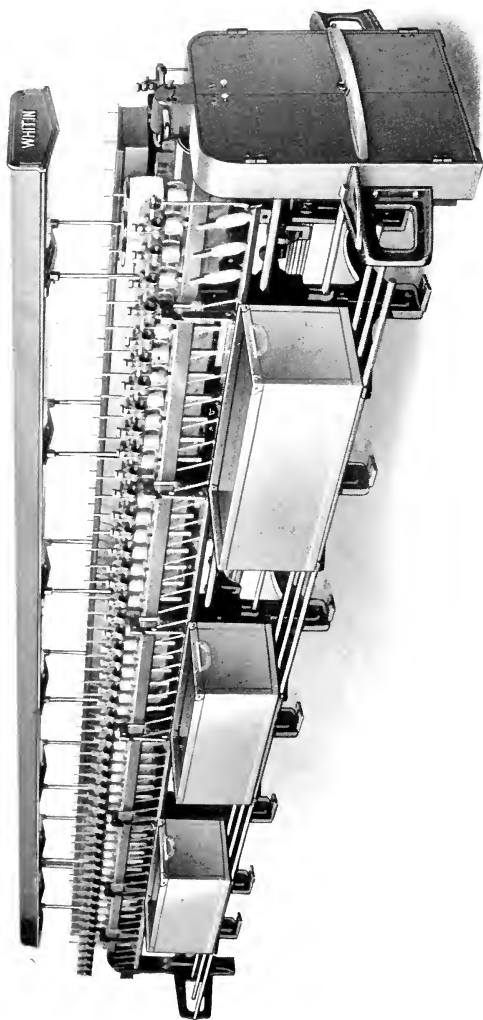
SPOOLING



Model B Spooler



Model C Spooler
equipped with empty bobbin
carrier



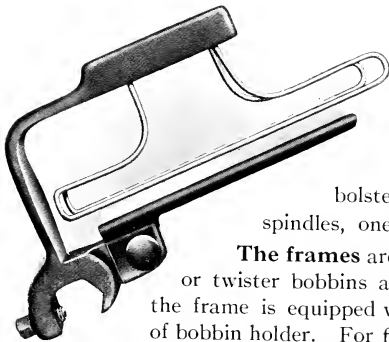
Model C Spooler
with side-box shelves and supply bobbin carrier

WHITIN SPOOLERS

We make two types of spoolers, viz: **Model B** and **Model C**, differing from each other in general design and drive of spindles.

MODEL B

This machine has long been favorably known to the trade, the general appearance of which is clearly shown in the illustration on page 126. The frame is of a substantial design, the ends being connected by four rigid iron girts, supported at frequent intervals by heavy sampsons. The ends and sampsons are fitted with adjustable feet to suit uneven flooring. The top girts holding the spindle bolsters furnish a firm foundation with a minimum amount of vibration for the spindles running at any economical speed.



**Wade Bobbin
Holder**

The spindles of the band driving type are as light as is consistent with the work demanded of them. They do not require oiling more than once a month, due to the large oil supply in the bolster case. One band drives two spindles, one on each side of the frame.

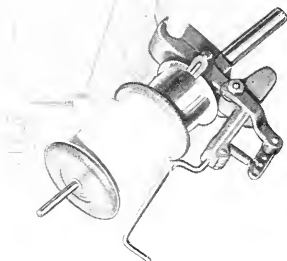
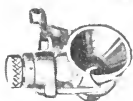
The frames are built to wind from warp, filling or twister bobbins as ordered. For warp bobbins the frame is equipped with the well-known Wade type of bobbin holder. For filling bobbins or cops the frame is fitted with skewers held on rods on each side of the frame. Side spindles are provided for winding from twister bobbins.

The thread guides are easily and positively set to suit the size of yarn by means of inclined adjusting feet with positive holding screws.

In order to obtain satisfactorily wound spools from **filling wound bobbins** it is essential that a uniform tension be imparted to the yarn in its passage from the bobbin to the spool, accordingly we have devised a number of different devices for this purpose which are illustrated on page 130.

No. 1 is our Patented ball tension wherein more tension may be obtained by additional balls held in the magazine.

WHITIN THREAD TENSIONS



No. 1

No. 2

No. 3

No. 4

No. 2 makes use of a steel ball supported in a porcelain cup, the tension depends on the weight of the ball.

No. 3 comprises two discs pressed together by a spring mounted on a stud, tension being varied by tightening or loosening the spring.

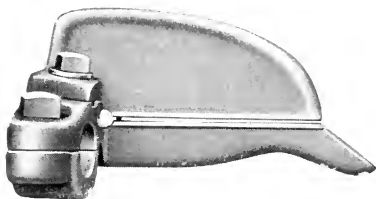
No. 4 is particularly adapted for rewinding heavy yarns.

The grid type of tension shown on page 132 meets the approval of many manufacturers.

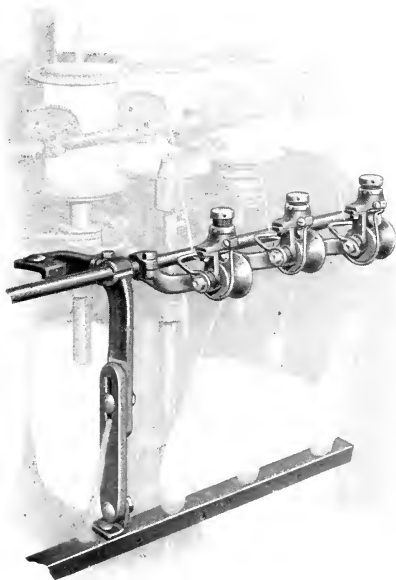
Old spoolers of any make may be satisfactorily arranged to spool from filling wound bobbins by the application of the construction as illustrated.

By this arrangement the weight of the supply bobbins and thread tensions is supported by the framing of the machine.

The traverse motion is actuated by a mangle wheel driving motion. On long frames two mangle wheels are used, thus ensuring a uniform and positive motion to the thread guides the entire length of the frame thereby guaranteeing perfectly wound spools. The lifting rod levers are pivoted to holders fixed to the traverse shaft, thus preventing any possibility of breakage to the mangle



Prest Guide



Tension Attachment for Old Machines

wheel or gearing due to any obstruction being caught under the lever, or lifting rods. The bobbin boxes may be of wood with iron ends and partitions as shown in the illustration or if preferred our "all metal" type of box can be substituted.

The driving pulleys vary in size from 8" to 14" diameter by $2\frac{1}{2}$ " face and run one revolution to 3.26 revolutions of spindle with $1\frac{3}{4}$ " diameter whirl. The driving shaft runs in a bearing supported on a rigid outrigger which also serves as a pulley guard. A locking belt shipper is provided.

MODEL C

This machine was designed with a view to combine to the best possible advantage all the most valuable points of previous machines with some new and important features. The most important features to be noted in this machine are: The ready accessibility to make necessary adjustments; the wide range of adjustments allowable; the simplicity of operation and the adaptability for maintaining a cleanly appearance to the machine at all times.

The framing of the machine is of an unusually solid construction, all parts being of ample proportions to withstand the maximum strains that they may be liable to. The head end is of the well-known "boxed" style fitted with sheet metal doors enclosing the traverse and mangle wheel gearing. This construction renders ready access to all necessary adjustments to the gearing.

Liability of any injury to an operative, when making adjustments or changing the gears, by the unexpected starting of the machine is entirely avoided by the use of a simple device which locks the belt shipping mechanism so that it is impossible to start the machine in motion while the doors are open.

Adjustable feet are provided on the foot end and also on all of the sampsons, thereby giving ready means for levelling the machine on the mill floor.



Grid Tension

The spindles are tape driven, thus insuring uniform speed and consequently properly wound spools. If preferred, however, the machine may be equipped with band driven spindles.

The thread guides, bobbin holders and thread tensions are the same as applied to Model B machine.

The traverse of the thread guide rods is accomplished by means of a shaft on each side of the machine on which are fixed pinions which mesh with rack teeth cut in the lifter rods. Breakage of the mangle or gearing connections by a stray spool or other obstruction under the descending lifter rods is absolutely prevented by a slip-coupling on each traverse shaft gear.

The traverse on either side of the machine is independently adjustable with relation to the mangle wheel settings. The mangle wheel provided with steel pins runs in oil, thus insuring ease in running and freedom from breakage and excessive wear.

Novel means are provided whereby the crown of the spool may be varied to suit necessary mill requirements.

The machine is fitted as ordered with any one of the following equipments:

Type No. 1.—Side shelves and empty bobbin carrier.

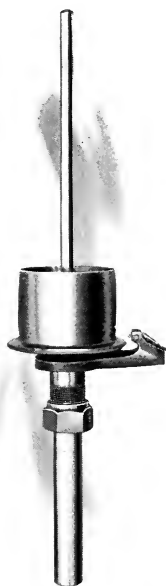
Type No. 2.—Side shelves and traversing supply bobbin carrier.

Type No. 3.—Side shelves without boxes or empty bobbin carrier.

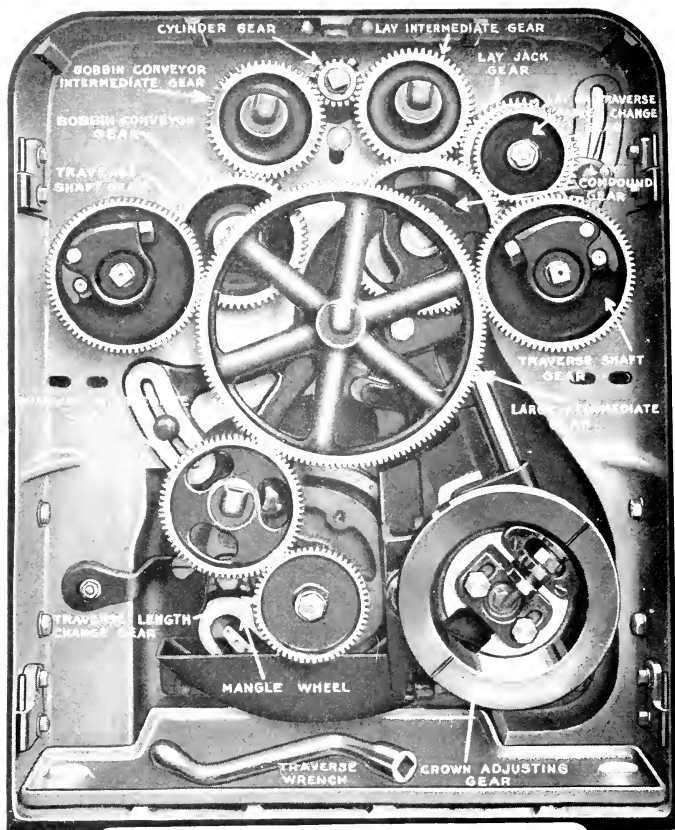
Type No. 4.—Side steel boxes and empty bobbin carrier.

Type No. 5.—Side steel boxes without empty bobbin carriers.

Type No. 6.—Side steel boxes and traversing supply bobbin carriers.

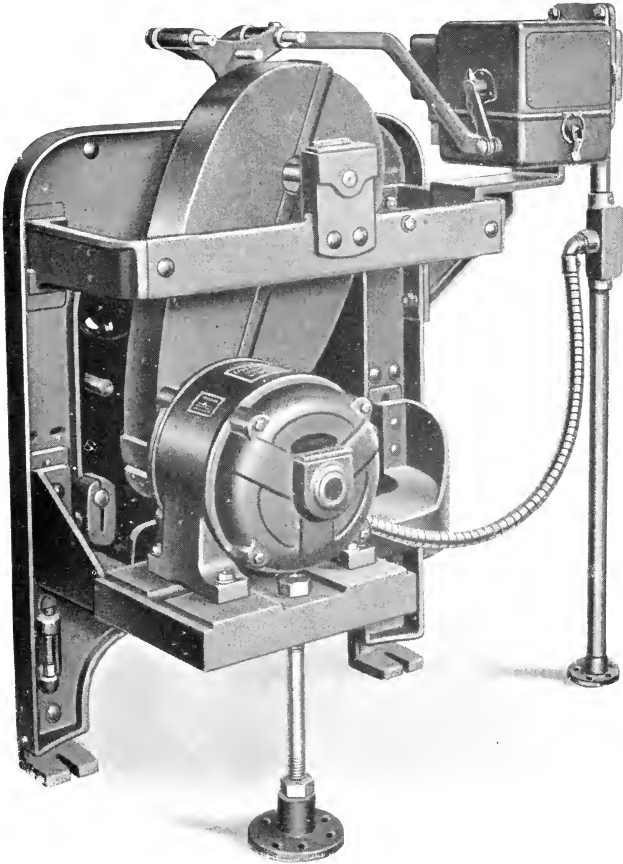


Tape Drive Spindle



Gearing of Model C Spooler.

Driving Pulleys 8" to 14" diameter by 2½" face and run one revolution to 2.55 revolutions of 3½" whirl driven by 8" cylinder with tape drive.



Geared Motor Drive

Production: See table, page 140. **Floor Space:** See pages 136 and 138.
Power required: 200 spindles per horsepower.

Weights per foot in length:

| | Model B | Model C |
|-------------------------|-----------------|------------|
| Domestic Net..... | 150 pounds..... | 200 pounds |
| Domestic Gross | 160 " | 222 " |
| Export Gross | 200 " | 260 " |
| Export Cubic Feet | 6 " | 6.3 |

MODEL B SPOOLER

Floor Space.

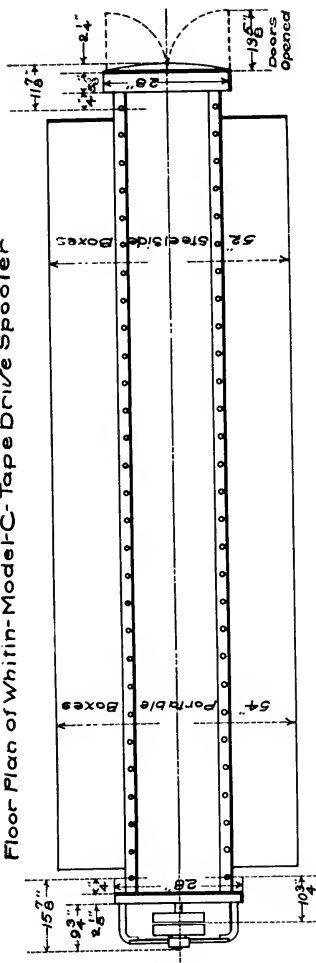
| No. of Spindles | 3½ in. Space. | | 4 in. Space. | | 4½ in. Space. | | 4¾ in. Space. | | 5 in. Space. | | 5¼ in. Space. | | 5½ in. Space. | | 5¾ in. Space. | | 6 in. Space. | |
|-----------------|---------------|-------|--------------|-------|---------------|------|---------------|-------|--------------|-------|---------------|-------|---------------|-------|---------------|-------|--------------|-------|
| | ft. | in. | ft. | in. | ft. | in. | ft. | in. | ft. | in. | ft. | in. | ft. | in. | ft. | in. | ft. | in. |
| 40 | 7 | 1/2 | 7 | 93/4 | 8 | 71/4 | 9 | 0 | 9 | 43/4 | 9 | 91/2 | 10 | 21/4 | 10 | 7 | 10 | 113/4 |
| 50 | 8 | 53/4 | 9 | 53/4 | 10 | 53/4 | 10 | 113/4 | 11 | 53/4 | 11 | 113/4 | 12 | 53/4 | 12 | 113/4 | 13 | 53/4 |
| 60 | 9 | 113/4 | 11 | 13/4 | 12 | 43/4 | 12 | 113/4 | 13 | 63/4 | 14 | 2 | 14 | 91/4 | 15 | 41/2 | 15 | 113/4 |
| 70 | 11 | 43/4 | 12 | 93/4 | 13 | 63/4 | 14 | 113/4 | 15 | 73/4 | 16 | 41/4 | 17 | 31/4 | 17 | 91/4 | 18 | 53/4 |
| 80 | 12 | 101/4 | 13 | 8 | 15 | 31/2 | 16 | 113/4 | 17 | 83/4 | 18 | 61/4 | 19 | 41/4 | 20 | 2 | 20 | 113/4 |
| 90 | 14 | 33/4 | 15 | 23/4 | 16 | 13/4 | 17 | 113/4 | 18 | 103/4 | 19 | 83/4 | 20 | 63/4 | 21 | 9 | 22 | 8 |
| 100 | 15 | 91/4 | 16 | 91/2 | 17 | 93/4 | 18 | 103/4 | 19 | 103/4 | 20 | 83/4 | 21 | 9 | 22 | 8 | 23 | 7 |
| 110 | 17 | 23/4 | 18 | 43/4 | 19 | 53/4 | 20 | 71/4 | 21 | 10 | 22 | 113/4 | 23 | 1/4 | 24 | 1/2 | 25 | 3/4 |
| 126 | 18 | 83/4 | 19 | 11 | 21 | 3 | 22 | 53/4 | 23 | 87/2 | 24 | 111/4 | 26 | 4 | 27 | 51/2 | 28 | 7 |
| 130 | 20 | 13/4 | 21 | 7 | 22 | 11 | 24 | 7 | 25 | 7 | 27 | 113/4 | 28 | 71/2 | 29 | 101/4 | 31 | 1 |
| 140 | 21 | 71/4 | 23 | 13/4 | 24 | 7 | 26 | 11 | 28 | 3 | 29 | 7 | 30 | 11 | 32 | 3 | 33 | 7 |
| 150 | 23 | 2 | 24 | 81/2 | 26 | 3 | 27 | 91/2 | 30 | 4 | 31 | 91/4 | 33 | 21/2 | 34 | 73/4 | 36 | 1 |
| 160 | 24 | 71/2 | 26 | 33/4 | 27 | 63/4 | 31 | 23/2 | 32 | 5 | 33 | 111/2 | 35 | 6 | 37 | 37 | 38 | 7 |
| 170 | 26 | 1 | 27 | 10 | 29 | 7 | 33 | 1 | 34 | 6 | 36 | 13/4 | 37 | 91/2 | 39 | 53/4 | 41 | 1 |
| 180 | 27 | 61/2 | 29 | 29 | 31 | 4 | 34 | 10 | 36 | 7 | 38 | 4 | 40 | 1 | 41 | 10 | 43 | 7 |
| 190 | 29 | 0 | 30 | 111/2 | 32 | 11 | 36 | 93/4 | 38 | 8 | 40 | 61/2 | 42 | 41/2 | 44 | 23/4 | 46 | 1 |
| 200 | 30 | 51/2 | 32 | 63/4 | 36 | 73/4 | 38 | 81/2 | 40 | 9 | 42 | 81/2 | 44 | 8 | 46 | 71/2 | 48 | 7 |
| | | | | | | | | | 42 | 10 | 44 | 113/4 | 46 | 111/2 | 49 | 3/4 | 51 | 1 |

Double Wave Motion used on Frames 21' 0" and over.

LENGTH OF MODEL C FRAMES OVER-ALL NOT INCLUDING OPENED HEAD END DOORS

| No. Spin. | 3' 2" | 3' 3" | 4" | 4 1/4" | 4 1/2" | 4 3/4" | 5" | 5 1/4" | 5 1/2" | 5 3/4" | 6" | 6 1/4" | 6 1/2" | 6 3/4" | 7" | 7 1/4" | 7 1/2" |
|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 40 | 7'-10 1/4" | 8'-3 3/4" | 8'-7 3/4" | 9'-0 1/2" | 9'-5 1/4" | 9'-10" | 10'-2 3/4" | 10'-7 1/2" | 11'-0 1/4" | 11'-5" | 11'-9 3/4" | 12'-2 1/2" | 12'-7 1/4" | 13'-0" | 13'-4 3/4" | 13'-9 1/2" | 14'-2 1/4" |
| 44 | 8'-5 1/4" | 8'-10 1/2" | 9'-3 3/4" | 9'-9" | 10'-2 1/4" | 10'-7 1/2" | 11'-0 3/4" | 11'-6" | 12'-1 1/4" | 12'-4 1/2" | 12'-9 3/4" | 13'-3" | 13'-8 1/4" | 14'-1 1/2" | 14'-6 3/4" | 15'-0" | 15'-5 1/4" |
| 48 | 8'-5 1/4" | 9'-6" | 9'-11 3/4" | 10'-5 1/2" | 10'-11 1/4" | 11'-5" | 11'-10 3/4" | 12'-4 1/2" | 12'-10 1/4" | 13'-4" | 13'-9 3/4" | 14'-3 1/2" | 14'-9 1/4" | 15'-3 1/2" | 15'-8 3/4" | 16'-2 1/2" | 16'-8 1/4" |
| 52 | 9'-7 1/4" | 10'-1 1/2" | 10'-7 3/4" | 11'-2" | 11'-8 1/4" | 12'-2 1/2" | 12'-8 3/4" | 13'-3" | 13'-9 1/4" | 14'-3 1/2" | 14'-9 3/4" | 15'-4" | 15'-10 1/4" | 16'-4 1/2" | 16'-10 3/4" | 17'-5" | 18'-1 1/4" |
| 56 | 10'-2 1/4" | 10'-9 1/2" | 11'-3 3/4" | 11'-10 1/2" | 12'-5 1/4" | 13'-0" | 13'-6 3/4" | 14'-1 1/2" | 14'-8 1/4" | 15'-3" | 15'-9 3/4" | 16'-4 1/2" | 16'-11 1/4" | 17'-6" | 18'-1 1/4" | 18'-7 1/2" | 19'-2 1/4" |
| 60 | 10'-9 1/4" | 11'-4 1/2" | 12'-7 3/4" | 13'-3" | 13'-10 1/2" | 14'-4 1/2" | 14'-11 1/4" | 15'-0 1/2" | 15'-7 1/4" | 16'-2 1/2" | 16'-9 3/4" | 17'-4 1/2" | 18'-0 1/4" | 18'-7 1/2" | 19'-2 1/4" | 19'-10" | 20'-5 1/4" |
| 64 | 11'-4 1/4" | 12'-0" | 12'-7 3/4" | 13'-3 1/2" | 14'-0" | 14'-11 1/4" | 15'-2 3/4" | 15'-10 1/2" | 16'-6 1/4" | 17'-2" | 17'-9 3/4" | 18'-5 1/2" | 19'-1 1/4" | 19'-9 1/4" | 20'-4 3/4" | 21'-0 1/2" | 21'-8 1/4" |
| 68 | 11'-11 1/4" | 12'-7 1/2" | 13'-3 3/4" | 14'-0" | 14'-11 1/4" | 15'-4 1/2" | 16'-0 3/4" | 16'-9 1/2" | 17'-5 1/4" | 18'-1 1/2" | 18'-9 3/4" | 19'-6" | 20'-2 1/4" | 20'-10 1/2" | 21'-6 3/4" | 22'-3 1/2" | 22'-11 1/4" |
| 72 | 12'-6 1/4" | 13'-3" | 13'-11 3/4" | 14'-8 1/2" | 15'-5 1/4" | 16'-2" | 16'-10 3/4" | 17'-7 1/2" | 18'-4 1/4" | 19'-1" | 19'-9 3/4" | 20'-6 1/2" | 21'-3 1/4" | 22'-0" | 22'-8 3/4" | 23'-5 1/2" | 24'-2 1/4" |
| 76 | 13'-1 1/4" | 13'-10 1/2" | 14'-7 3/4" | 15'-5" | 16'-2 1/4" | 16'-11 1/2" | 17'-8 3/4" | 18'-6" | 19'-3 1/4" | 20'-0 1/2" | 20'-9 3/4" | 21'-7 1/2" | 22'-4 1/4" | 23'-1 1/2" | 23'-10 3/4" | 24'-8" | 25'-5 1/4" |
| 80 | 13'-8 1/4" | 14'-6" | 15'-3 3/4" | 16'-1 1/2" | 16'-11 1/4" | 17'-9" | 18'-6 3/4" | 19'-4 1/2" | 20'-2 1/4" | 21'-0" | 21'-9 3/4" | 22'-7 1/2" | 23'-4 1/4" | 24'-3" | 25'-0 3/4" | 25'-10 1/2" | 26'-8 1/4" |
| 84 | 14'-3 1/4" | 15'-1 1/2" | 15'-11 3/4" | 16'-10" | 17'-8 1/4" | 18'-6 1/2" | 19'-4 3/4" | 20'-3" | 21'-1 1/4" | 21'-11 1/2" | 22'-9 3/4" | 23'-8" | 24'-6 1/4" | 25'-4 1/2" | 26'-2 3/4" | 27'-1 1/2" | 28'-1 1/4" |
| 88 | 14'-10 1/4" | 15'-9" | 16'-7 3/4" | 17'-6 1/2" | 18'-5 1/4" | 19'-4" | 20'-2 3/4" | 21'-1 1/2" | 22'-0 1/4" | 22'-11 1/2" | 23'-0 3/4" | 24'-8 1/4" | 25'-7 1/4" | 26'-6" | 27'-4 3/4" | 28'-3 1/2" | 29'-2 1/4" |
| 92 | 15'-1 1/4" | 16'-4 1/2" | 17'-3 3/4" | 18'-3" | 19'-2 1/4" | 20'-1 1/2" | 21'-0 3/4" | 22'-0" | 23'-11 1/4" | 24'-10" | 25'-9 3/4" | 26'-9 1/2" | 27'-8 1/4" | 28'-7 1/2" | 29'-6 3/4" | 30'-5 1/4" | 31'-4 1/4" |
| 96 | 16'-0 1/4" | 17'-0" | 17'-11 3/4" | 18'-11 1/2" | 19'-11 1/4" | 20'-11" | 21'-10 3/4" | 22'-10 1/2" | 23'-10 1/4" | 24'-10" | 25'-9 3/4" | 26'-9 1/2" | 27'-9 1/4" | 28'-9" | 29'-8 3/4" | 30'-8 1/2" | 31'-8 1/4" |
| 100 | 16'-7 1/4" | 17'-7 1/2" | 18'-7 3/4" | 19'-8" | 20'-8 1/4" | 21'-8 1/2" | 22'-8 3/4" | 23'-9" | 24'-9 1/4" | 25'-9 1/2" | 26'-9 3/4" | 27'-10" | 28'-10 1/4" | 29'-10 1/2" | 30'-10 3/4" | 31'-11" | 32'-11 1/4" |
| 104 | 17'-2 1/4" | 18'-3" | 19'-3 3/4" | 20'-4 1/2" | 21'-5 1/4" | 22'-6" | 23'-6 3/4" | 24'-7 1/2" | 25'-8 1/4" | 26'-9" | 27'-9 3/4" | 28'-10 1/2" | 29'-11 1/4" | 30'-11 1/2" | 31'-12 1/4" | 32'-13 1/4" | 33'-1 1/4" |
| 108 | 17'-9 1/4" | 18'-10 1/2" | 19'-11 3/4" | 21'-1" | 22'-2 1/4" | 23'-3 1/2" | 24'-4 3/4" | 25'-6" | 26'-7 1/4" | 27'-8 1/2" | 28'-9 3/4" | 29'-11" | 30'-11 1/4" | 31'-12 1/2" | 32'-13 1/4" | 33'-1 1/2" | 34'-2 1/4" |
| 112 | 18'-4 1/4" | 19'-6" | 20'-7 3/4" | 21'-9 1/2" | 22'-11 1/4" | 24'-1" | 25'-2 3/4" | 26'-4 1/2" | 27'-6 1/4" | 28'-8" | 29'-9 3/4" | 30'-11 1/2" | 31'-12 1/4" | 32'-13 1/2" | 33'-2 3/4" | 34'-4" | 35'-5 1/4" |
| 116 | 18'-11 1/4" | 20'-1 1/2" | 21'-3 3/4" | 22'-6" | 23'-8 1/4" | 24'-10 1/2" | 26'-0 3/4" | 27'-3" | 28'-5 1/4" | 29'-7 1/2" | 30'-9 3/4" | 32'-0" | 33'-2 1/4" | 34'-4 1/2" | 35'-6 3/4" | 36'-9" | 37'-11 1/4" |
| 120 | 19'-6 1/4" | 20'-9" | 21'-11 3/4" | 23'-2 1/2" | 24'-5 1/4" | 25'-8" | 26'-10 3/4" | 28'-1 1/2" | 29'-4 1/4" | 30'-7" | 31'-9 3/4" | 33'-0 1/2" | 34'-3 1/4" | 35'-6 1/2" | 36'-9 3/4" | 37'-11 1/2" | 38'-2 1/4" |
| 124 | 20'-1 1/4" | 21'-4 1/2" | 22'-7 3/4" | 23'-11" | 25'-2 1/4" | 26'-5 1/2" | 27'-8 3/4" | 29'-0" | 30'-3 1/4" | 31'-6 1/2" | 32'-9 3/4" | 34'-1" | 35'-4 1/4" | 36'-7 1/2" | 37'-10 3/4" | 38'-2 1/4" | 39'-5 1/4" |
| 128 | 20'-8 1/4" | 22'-0" | 23'-3 3/4" | 24'-7 1/2" | 25'-11 1/4" | 27'-3" | 28'-6 3/4" | 29'-10 1/2" | 31'-2 1/4" | 32'-6" | 33'-9 3/4" | 35'-1 1/2" | 36'-5 1/4" | 37'-9 1/2" | 38'-12 1/4" | 39'-5 1/4" | 40'-5 1/4" |
| 132 | 21'-3 1/4" | 23'-7 1/2" | 24'-11 3/4" | 25'-4" | 26'-8 1/4" | 28'-0 1/2" | 29'-3 3/4" | 30'-9" | 32'-1 1/4" | 33'-5 1/2" | 34'-9 3/4" | 36'-2 1/2" | 37'-6 1/4" | 38'-10 1/2" | 39'-4 3/4" | 40'-1 1/2" | 41'-8 1/4" |
| 136 | 21'-10 1/4" | 23'-3" | 24'-7 3/4" | 26'-0 1/2" | 27'-5 1/4" | 28'-10" | 30'-2 3/4" | 31'-7 1/2" | 33'-0 1/4" | 34'-5" | 35'-9 3/4" | 37'-2 1/2" | 38'-7 1/4" | 39'-11 1/2" | 40'-2 3/4" | 41'-7" | 42'-11 1/4" |
| 140 | 22'-5 1/4" | 23'-10 1/2" | 25'-3 3/4" | 26'-9" | 28'-2 1/4" | 29'-7 1/2" | 31'-0 3/4" | 33'-6" | 35'-11 1/4" | 37'-4 1/2" | 39'-9 3/4" | 41'-5 1/2" | 43'-1 1/4" | 45'-7 1/2" | 48'-2 1/4" | 50'-5 1/4" | 51'-8 1/4" |
| 144 | 23'-0 1/4" | 24'-6" | 25'-11 3/4" | 27'-5 1/2" | 28'-11 1/4" | 30'-5" | 31'-10 3/4" | 33'-1 1/2" | 35'-4 1/2" | 37'-8 1/4" | 39'-11 1/2" | 41'-6 1/2" | 43'-1 1/4" | 45'-7 1/2" | 48'-2 1/4" | 50'-5 1/4" | 51'-8 1/4" |
| 148 | 23'-7 1/4" | 25'-1 1/2" | 26'-7 3/4" | 28'-2" | 29'-8 1/4" | 31'-2 1/2" | 32'-8 3/4" | 34'-3" | 36'-4 1/2" | 38'-7 1/2" | 40'-9 1/4" | 42'-1 1/2" | 44'-3 1/4" | 46'-6 1/2" | 48'-1 1/4" | 50'-5 1/4" | 51'-8 1/4" |
| 152 | 24'-2 1/4" | 25'-9" | 27'-3 3/4" | 28'-7 1/2" | 30'-5 1/4" | 32'-0" | 33'-6 3/4" | 35'-1 1/2" | 36'-8 1/4" | 38'-3" | 39'-9 3/4" | 41'-4 1/2" | 42'-11 1/4" | 44'-6 1/2" | 46'-0 3/4" | 47'-7 1/2" | 49'-2 1/4" |
| 156 | 24'-9 1/4" | 26'-4 1/2" | 27'-11 3/4" | 29'-0 1/2" | 30'-8 1/4" | 32'-7 1/2" | 34'-1 1/4" | 36'-0" | 37'-7 1/4" | 38'-6 1/4" | 40'-2" | 41'-9 3/4" | 43'-1 1/4" | 44'-6 1/2" | 46'-0 3/4" | 47'-7 1/2" | 49'-2 1/4" |
| 160 | 25'-4 1/4" | 27'-0" | 28'-7 3/4" | 30'-3 1/2" | 31'-11 1/4" | 33'-7" | 35'-2 3/4" | 36'-10 1/2" | 38'-6 1/4" | 40'-2" | 41'-9 3/4" | 43'-1 1/2" | 44'-10 1/4" | 46'-9 1/4" | 48'-4 1/4" | 50'-5 1/4" | 51'-8 1/4" |
| 164 | 25'-11 1/4" | 27'-7 1/2" | 29'-3 3/4" | 31'-0" | 32'-8 1/4" | 34'-4 1/2" | 36'-0 3/4" | 37'-9 1/4" | 39'-5 1/4" | 41'-1 1/2" | 42'-9 3/4" | 44'-6 1/2" | 46'-2 1/4" | 48'-4 1/4" | 50'-5 1/4" | 51'-8 1/4" | 52'-1 1/4" |
| 168 | 26'-6 1/4" | 28'-3" | 29'-11 3/4" | 31'-8 1/2" | 33'-5 1/4" | 35'-2" | 36'-10 3/4" | 38'-7 1/2" | 40'-4 1/4" | 42-1" | 43'-9 3/4" | 45'-6 1/2" | 47-3 1/4" | 49-0" | 50-8 3/4" | 51-3" | 52-1 1/4" |
| 172 | 27'-1 1/4" | 28'-9 1/2" | 30'-3 3/4" | 32'-5" | 34'-2 1/4" | 35-11 1/2" | 37-8 3/4" | 39-6" | 41-3 1/4" | 43-0 1/2" | 44-9 3/4" | 46-7 1/2" | 48-4 1/4" | 50-11 1/2" | 51-10 3/4" | 52-1 1/4" | 53-1 1/4" |
| 176 | 27'-8 1/4" | 29'-6" | 30'-7 3/4" | 32-5 1/2" | 34-2 1/4" | 35-11 1/2" | 37-8 3/4" | 39-6" | 41-3 1/4" | 43-0 1/2" | 44-9 3/4" | 46-7 1/2" | 48-4 1/4" | 50-11 1/2" | 51-10 3/4" | 52-1 1/4" | 53-1 1/4" |
| 180 | 28'-3 1/4" | 30'-1 1/2" | 31'-11 3/4" | 33-10 1/2" | 35-8 1/4" | 37-6 1/2" | 39-4 3/4" | 41-3" | 43-1 1/4" | 44-11 1/2" | 46-9 3/4" | 48-8" | 50-6 1/4" | 51-5 1/2" | 52-1 1/4" | 53-1 1/4" | 54-1 1/4" |
| 184 | 28'-10 1/4" | 30-9" | 32-7 3/4" | 34-6 1/2" | 36-5 1/4" | 38-4" | 40-2 3/4" | 42-0 1/2" | 43-8 1/4" | 45-6 1/2" | 47-5 1/2" | 49-4 1/4" | 51-3 1/4" | 53-1 1/4" | 54-1 1/4" | 55-1 1/4" | 56-1 1/4" |
| 188 | 29'-5 1/4" | 31-4 1/2" | 33-1 1/2" | 35-11 1/2" | 37-2 1/4" | 39-1 1/2" | 41-0 3/4" | 43-0" | 44-11 1/4" | 46-10 1/2" | 48-9 3/4" | 50-9" | 51-9 1/2" | 52-1 1/4" | 53-1 1/4" | 54-1 1/4" | 55-1 1/4" |
| 192 | 30'-0 1/4" | 32-0" | 33-11 3/4" | 35-11 1/2" | 37-11 3/4" | 39-11" | 41-10 3/4" | 43-10 1/2" | 45-10 1/4" | 47-10" | 49-9 3/4" | 51-9 1/2" | 52-1 1/4" | 53-1 1/4" | 54-1 1/4" | 55-1 1/4" | 56-1 1/4" |
| 196 | 30'-7 1/4" | 32-7 1/2" | 34-7 3/4" | 36-8" | 38-8 1/4" | 40-8 1/2" | 42-8 3/4" | 44-9" | 46-9 1/4" | 48-9 1/2" | 50-9 3/4" | 51-9 1/2" | 52-1 1/4" | 53-1 1/4" | 54-1 1/4" | 55-1 1/4" | 56-1 1/4" |
| 200 | 31'-2 1/4" | 33-3" | 35-3 3/4" | 37-4 1/2" | 39-5 1/4" | 41-6" | 43-6 3/4" | 45-7 1/2" | 47-8 1/4" | 49-9" | 51-9 3/4" | 52-1 1/4" | 53-1 1/4" | 54-1 1/4" | 55-1 1/4" | 56-1 1/4" | 57-1 1/4" |

Floor Plan of Whittin-Model-C- Tape Drive Spooler



Production Table of Spooler

| Dimensions of Spools. | | Number of Yarn. | Revolutions per Minute of | | | No. Within Gravity Spindles to one Spooler Spindle at 825 Rev. |
|-----------------------|--------------------|-----------------|-----------------------------|-------------|-------------|--|
| Length between Heads. | Diameter of Heads. | | Spindle 750 | Spindle 825 | Spindle 900 | |
| | | | Pounds per Day per Spindle. | | | |
| 6 in. | 5 in. | { 8 | 13.8 | 11.8 | 12.9 | 12 |
| | | { 10 | 8.6 | 9.5 | 10.3 | |
| | | { 12 | 7.2 | 7.9 | 8.6 | |
| | | { 14 | 6.2 | 6.8 | 7.4 | |
| | | { 16 | 5.4 | 5.9 | 6.5 | |
| | | { 18 | 4.8 | 5.3 | 5.8 | 13 |
| | | { 20 | 4.3 | 4.8 | 5.2 | |
| | | { 22 | 3.9 | 4.3 | 4.7 | |
| | | { 24 | 3.6 | 4.0 | 4.3 | |
| | | { 26 | 3.3 | 3.7 | 4.0 | |
| 5 in. | 4 in. | { 28 | 3.1 | 3.4 | 3.7 | 14 |
| | | { 30 | 2.9 | 3.2 | 3.5 | |
| | | { 32 | 2.7 | 3.0 | 3.3 | |
| | | { 34 | 2.6 | 2.8 | 3.1 | |
| | | { 36 | 2.4 | 2.7 | 2.9 | |
| 4½ in. | 3½ in. | { 38 | 2.3 | 2.5 | 2.7 | 15 |
| | | { 40 | 2.2 | 2.4 | 2.6 | |
| | | { 44 | 2.0 | 2.2 | 2.4 | |
| | | { 50 | 1.8 | 1.9 | 2.1 | |
| | | { 60 | 1.5 | 1.6 | 1.8 | |
| 3½ in. | 3¼ in. | { 70 | 1.3 | 1.4 | 1.5 | 16 |
| | | { 80 | 1.1 | 1.2 | 1.3 | |
| | | { 90 | 1.0 | 1.1 | 1.2 | |
| 3 in. | 2¾ in. | { 100 | .9 | 1.0 | 1.1 | 17 |
| | | | | | | |

TWISTING

COTTON RING TWISTING FRAMES

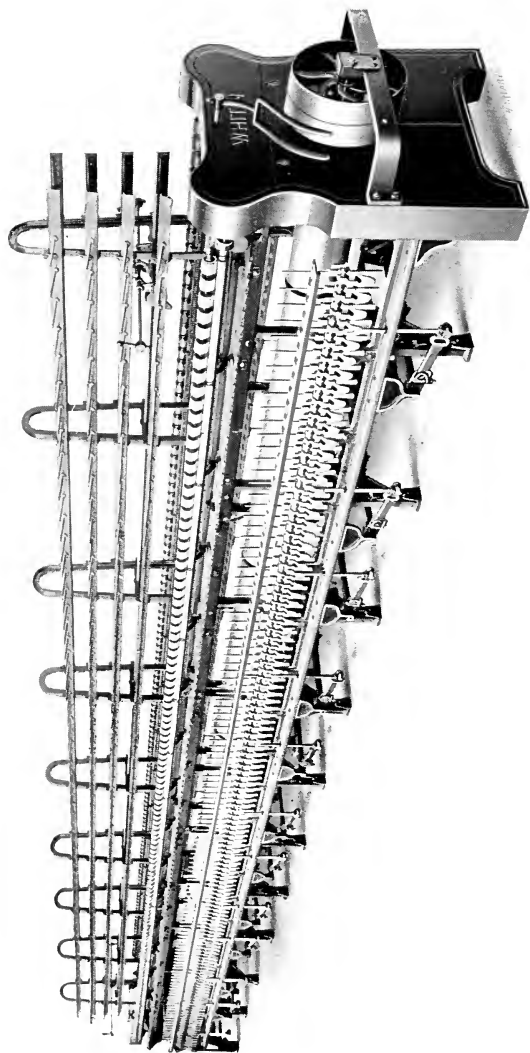
The Whitin Twisting Frames are the outcome of nearly a century of experience in the making of textile machinery. Ever since 1831 when the organization that is now the Whitin Machine Works came into existence, the aim has been to produce textile machinery of the highest quality. Today Whitin machinery is known amongst textile manufacturing interests throughout the world as being dependable in producing maximum efficiency in operation, durability and productive abilities.

To meet the requirements of yarn manufacturers we make three types of cotton twistors, viz: Regular, Heavy and Extra Heavy. These comprise four models, viz.: Model A, Model B, Model C and Model D. These models are equipped for either dry or wet twisting as ordered, detailed descriptions of which are given in the following pages.

The standard of proportions that enters into the designs of these machines is the result of what has been deemed best for practical working mill conditions. The general assembly of parts is so well balanced that the machines efficiently meet every condition which arises in the production of twisted yarns. They are easy and convenient to operate, changes in gearing are easily made, and all mechanisms are readily accessible.

Types and Dimensions of Whitin Ring Twisters

| Type | Width | Space | Max. Diam. of Ring | Max. Diam. of Bobbin | Width of Side Rails | Diam. of Lifting Rods | Traverse |
|-------------|-------|-------------------|-----------------------------|-------------------------------|------------------------------|--------------------------------|----------|
| Regular | 36" | 2 $\frac{3}{4}$ " | 1 $\frac{5}{8}$ " | 1 $\frac{1}{2}$ " | 2 $\frac{5}{8}$ " | $\frac{3}{4}$ " | 5"-7" |
| | | 3" | 2" | 1 $\frac{7}{8}$ " | 2 $\frac{5}{8}$ " | $\frac{3}{4}$ " | 5"-7" |
| | | 3 $\frac{1}{4}$ " | 2 $\frac{1}{4}$ " | 2 $\frac{1}{8}$ " | 2 $\frac{5}{8}$ " | $\frac{3}{4}$ " | 5"-7" |
| | 39" | 3 $\frac{1}{2}$ " | 2 $\frac{1}{2}$ " | 2 $\frac{3}{8}$ " | 2 $\frac{5}{8}$ " | $\frac{3}{4}$ " | 5"-7" |
| | | 3 $\frac{3}{4}$ " | 2 $\frac{3}{4}$ " | 2 $\frac{5}{8}$ " | 2 $\frac{5}{8}$ " | $\frac{3}{4}$ " | 5"-7" |
| | | 4" | 3" | 2 $\frac{7}{8}$ " | 2 $\frac{5}{8}$ " | $\frac{3}{4}$ " | 5"-7" |
| | | 4 $\frac{1}{2}$ " | 3 $\frac{1}{2}$ " | 3 $\frac{3}{8}$ " | 2 $\frac{5}{8}$ " | $\frac{3}{4}$ " | 5"-7" |
| | 42" | 5" | 4" | 3 $\frac{3}{4}$ " | 2 $\frac{5}{8}$ " | $\frac{3}{4}$ " | 5"-7" |
| | | 5 $\frac{1}{2}$ " | 4 $\frac{1}{2}$ " | 4 $\frac{1}{4}$ " | 2 $\frac{5}{8}$ " | $\frac{3}{4}$ " | 5"-7" |
| Heavy | 42" | 5" | 3 $\frac{3}{4}$ " | 3 $\frac{1}{2}$ " | 3 $\frac{3}{8}$ " | 1 $\frac{5}{16}$ " | 6"-8" |
| | | 5 $\frac{1}{2}$ " | 4 $\frac{1}{4}$ " | 4" | 3 $\frac{3}{8}$ " | 1 $\frac{5}{16}$ " | 6"-8" |
| | | 6" | 4 $\frac{1}{2}$ " | 4 $\frac{1}{4}$ " | 3 $\frac{3}{8}$ " | 1 $\frac{5}{16}$ " | 6"-8" |
| | | 6 $\frac{1}{2}$ " | 5" | 4 $\frac{3}{4}$ " | 3 $\frac{3}{8}$ " | 1 $\frac{5}{16}$ " | 6"-8" |
| Extra Heavy | 42" | 6 $\frac{1}{2}$ " | 5" | 4 $\frac{3}{4}$ " | 3 $\frac{3}{8}$ " | 1 $\frac{1}{8}$ " | 7"-9" |
| | | 7" | 5 $\frac{1}{2}$ " | 5" | 3 $\frac{3}{8}$ " | 1 $\frac{1}{8}$ " | 7"-9" |
| | | 7 $\frac{1}{2}$ " | 6" | 5 $\frac{1}{2}$ " | 3 $\frac{3}{8}$ " | 1 $\frac{1}{8}$ " | 7"-9" |
| | | 8" | 6 $\frac{1}{2}$ " | 6" | 3 $\frac{3}{8}$ "-4" | 1 $\frac{1}{8}$ " | 7"-9" |
| | | 8 $\frac{1}{2}$ " | 6 $\frac{3}{4}$ " | 6 $\frac{1}{4}$ " | 4" | 1 $\frac{3}{8}$ " | 8"-10" |
| | | 9" | 7 $\frac{1}{4}$ " | 6 $\frac{1}{2}$ " | 4" | 1 $\frac{3}{8}$ " | 8"-10" |
| | | 9 $\frac{1}{2}$ " | 7 $\frac{1}{2}$ " | 6 $\frac{3}{4}$ " | 4" | 1 $\frac{3}{8}$ " | 8"-10" |
| | | 10" | 7 $\frac{3}{4}$ " | 7" | 4" | 1 $\frac{3}{8}$ " | 8"-10" |



Twisting Frame, Model A, with Band Driven Spindles

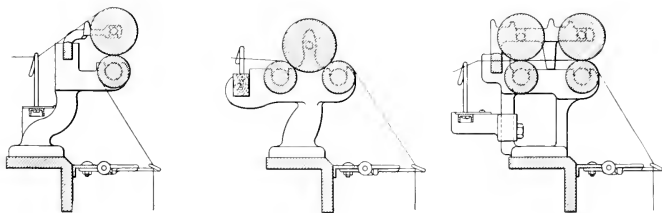
MODEL A

REGULAR TWISTER

This machine, designed for light work, is very strong and substantially built either 36 inches or 39 inches wide, from $2\frac{1}{2}$ inches to $4\frac{1}{2}$ inches space, is equipped with band driven spindles and rings best adapted for any required duty. Traverse adjustable from 5 to 7 inches. Adjustable feet are provided for the sampsons and foot ends in order to facilitate the levelling of the frame.

The Spool creel is made for any number of ply desired and consists of cast iron uprights supporting skewer rails of angle iron, rigidly held in position, easily adjusted or removed.

The twist and builder motion gearings are enclosed in the boxed end, easily accessible by removable panels held in position by an efficient locking device. All gearing is machine cut, thus ensuring comparatively silent running. A wide range in twist combinations is afforded by the change gearing. If so specified, the twist gearing may be arranged so that each side of the frame is driven independent of the other, thus producing two different twists simultaneously.



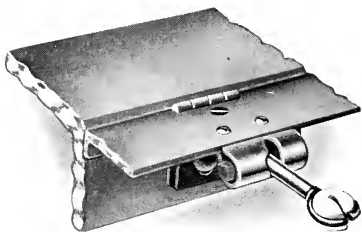
Arrangement of Twister Rolls

The rolls are furnished in three styles, viz.: two lines of bottom rolls, with a single line of top rolls, generally used for heavy dry twisting; a single line of bottom rolls with a single line of top rolls adapted for either dry or wet twisting, and also double line of bottom and double line top rolls for fancy yarns. For dry twisting, the bottom rolls are of steel and the top rolls of cast iron, whereas for wet twisting both top and bottom rolls are of brass or brass covered, which, being non-corrosive, prevents staining of the yarn.

A **traverse motion** for preventing creasing of the rolls by the yarn is provided.

The **thread boards** are of highly polished wood unless boards of metallic construction are ordered. Any of the usual forms of wire or porcelain guides furnished as desired.

A **yardage motion** may be applied if desired by means of which the frame is stopped when a predetermined number of yards has been wound on the bobbins. Hank Clocks also may be readily attached to the machines.

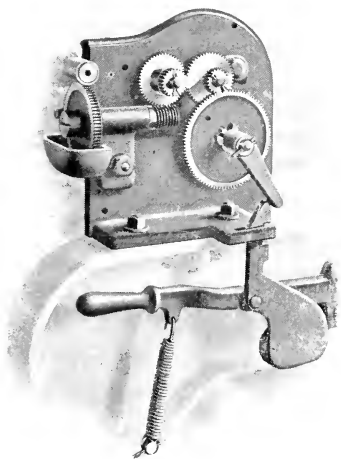


Metallic Thread Board.

For **dry twisting**, the guides, hinges and screws are of steel, whereas, for wet twisting, these parts are of brass. A thread board lifter is applied on each side of the frame whereby all the guides may be lifted together preparatory to doffing the frame.

The **spindles** with which the frame is equipped are band driven Whitin Gravity Type of a size best suited for the requirements. (See specifications of Spindles on page 157.)

A simple and effective **knee-brake** is provided for each spindle whereby the motion of the spindle is arrested for the purpose of piecing up.



Yardage Motion

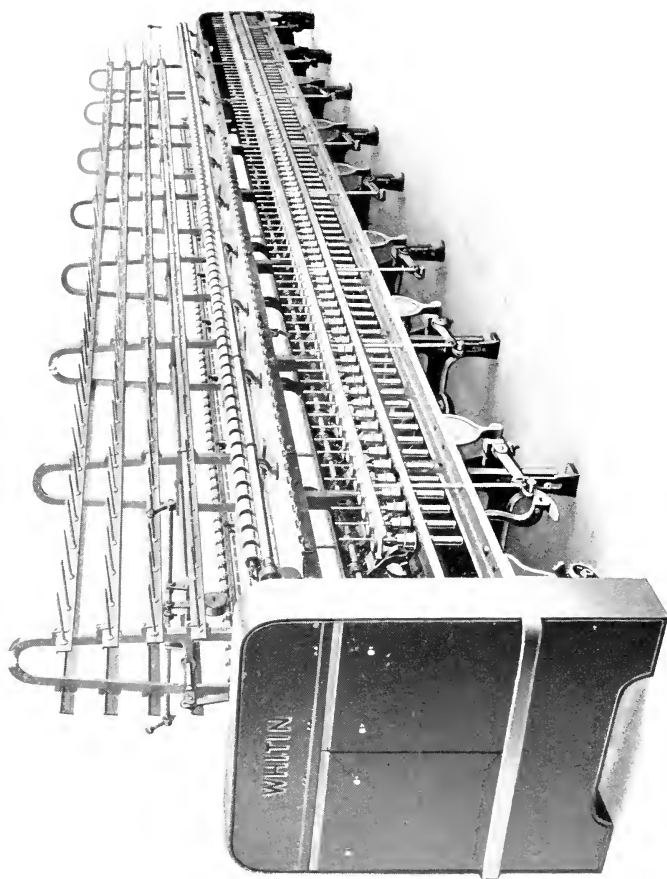
The **builder motion** may be arranged to form bobbins with straight top, taper top, warp or filling winds, the change from one wind to another being quickly and easily accomplished.

The ring rails are conveniently levelled by means of an adjusting screw on the lifting arm.

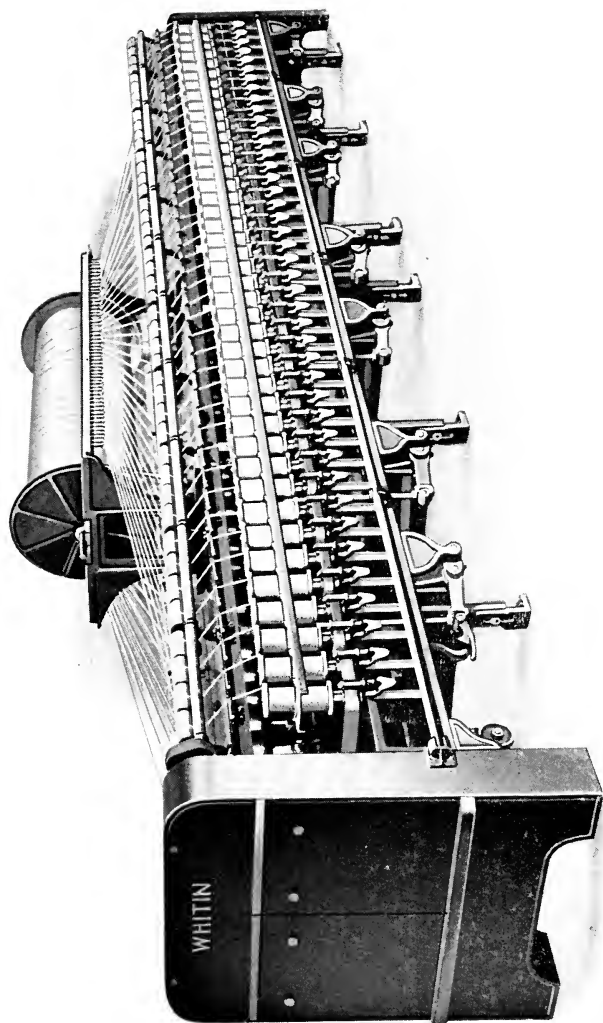
The cylinders, seven or eight inches in diameter, are supported in self-oiling boxes so arranged that the cylinders may be readily removed for repairs and returned to place without any readjustments required. Ball or roller bearings for the cylinder may be had if so ordered.

The driving pulleys located on either the foot or head end range from six inches to twenty-two inches in diameter with two inches to four inches face. The loose pulley runs on a sleeve which is integral with the yoke box supporting the end of the driving arbor. By this construction, excessive wear is eliminated in the bearing of the loose pulley as it does not revolve when the belt is on the tight pulley. The support of the outer box of the driving arbor also serves as a guard for pulley and belt.

The frames may be arranged, when so ordered, to be driven by an **electric motor**, either by direct connection to the cylinder driving arbor, or by gearing to the same.



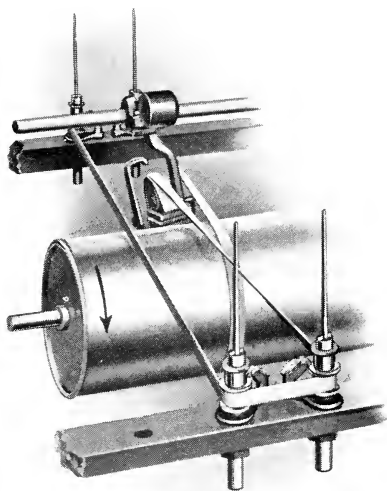
Twisting Frame, Model B, with Tape Driven Spindles.



Model B Twisting Frame with Section Beam Creel.

MODEL B REGULAR TWISTER

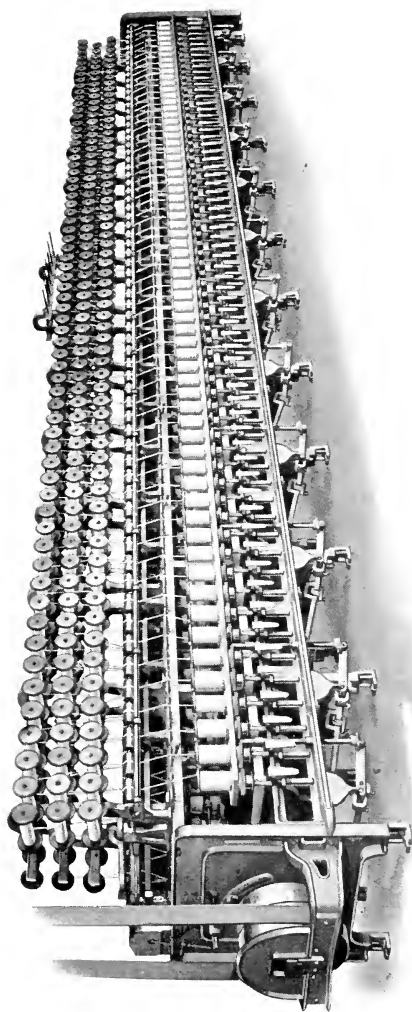
This machine in general details is similar to Model A, the exceptions being in the design of the geared end and the equipment being for tape driven spindles only. It is built in widths of 39 inches and 42 inches and any required number of Heavy or Extra Heavy Spindles in 3-inch to 5½-inch spaces, traverse adjustable from 5 to 7 inches, driving pulleys on either head or foot end as ordered.



Tape Drive Spindles

The twist gearing inclosed in the boxed end is similar in most respects to Model A, the builder motion, however, being of the worm and gear type, thus reducing the amount of backlash to a minimum.

The spool creels are of a like construction to that of Model A, although if a manufacturer desires to twist yarns from section beams, supports of ample strength are provided. For a description of other details, see that of Model A.



Model C Heavy Twister

MODEL C

HEAVY TWISTER

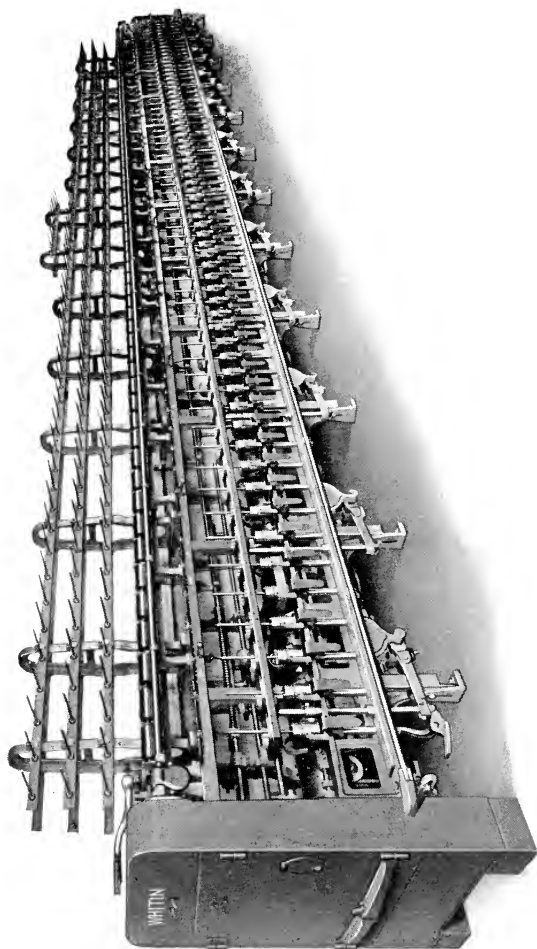
This machine designed for somewhat heavier work than either Models A or B is 42 inches wide, equipped with any required number of Extra Heavy tape driven spindles in 5 to 6½-inch spaces, with traverse adjustable from 6 to 8 inches. Driving pulleys located on foot end only range from 12 to 20 inches diameter by 4¼-inch face.

The details of this machine are much heavier than those of Models A and B. **All gearing** is enclosed in a heavy boxed end to which ready access is obtained through swinging doors which are provided with a locking device acting in conjunction with the belt shipping mechanism, thus preventing the unexpected starting of the machine while the doors are open, and the doors cannot be opened while the machine is running, thereby preventing possible injury to the operatives in their work about the machine.

When it is desired to "slaken off" the ends, as is sometimes necessary, a manually operated ring rail **wind-down device** is provided (illustrated on page 155.) This motion comprises a gear in a clutching relation with the gearing driving the builder motion. By means of a crank inserted by the operative in a socket provided in the hub of the gear on which the clutch gear is mounted, the clutch is disengaged, thus disconnecting the builder motion gearing, when the ring rails may be raised or lowered as desired.

The thread boards may be any of our usual styles of wood, cast iron, or our patent metallic, as desired, and are fitted with suitable guides to meet requirements.

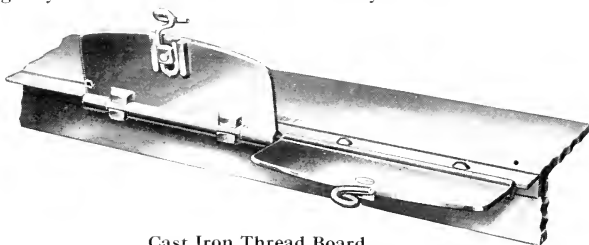
The creels arranged for spools of any number of ply, as desired, or for section beams if preferred.



Model D Extra Heavy Twisting Frame

MODEL D EXTRA HEAVY TWISTER

This machine is especially designed for heavy duty required in the twisting of yarns for tire duck or other heavy fabrics.

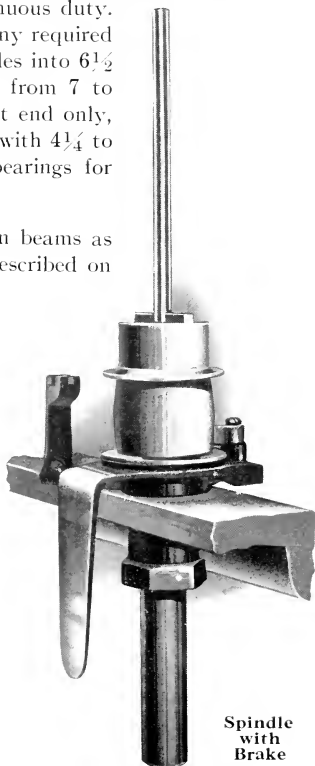


Cast Iron Thread Board

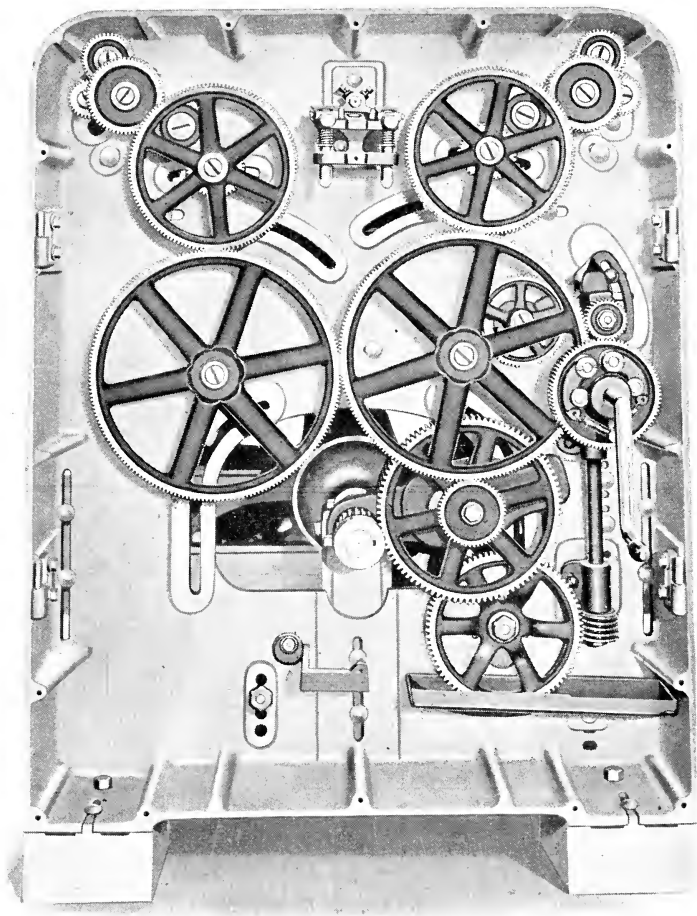
Its rigid construction eliminates all chance of vibration, thus making the machine particularly adapted for strenuous duty. It is built 42 inches wide, equipped with any required number of Extra Heavy tape driven spindles into $6\frac{1}{2}$ to 10-inch spaces, with traverse adjustable from 7 to 10 inches. Driving pulleys located on foot end only, are furnished in 12 to 20 inches diameters with $4\frac{1}{4}$ to $6\frac{1}{4}$ -inches width of face. Ball or roller bearings for the cylinder if desired.

The creel may be for spools or section beams as ordered. A ring rail wind-down device, described on page 152, is furnished.

The bottom rolls, $1\frac{1}{2}$ -inches or 2-inches diameter, are arranged in two lines with one line of heavy top rolls. The thread boards are of cast iron of heavy design, and equipped with adjustable thread guides of wire or porcelain. An efficient knee brake is fitted to each spindle. The geared or head end is of similar construction to that of Model C. (See description, page 152.) For the longer traverses, extension blocks are inserted beneath the footings of the end, thus increasing the height of the machine. A **yardage motion**, such as illustrated on page 146, may be had if ordered.



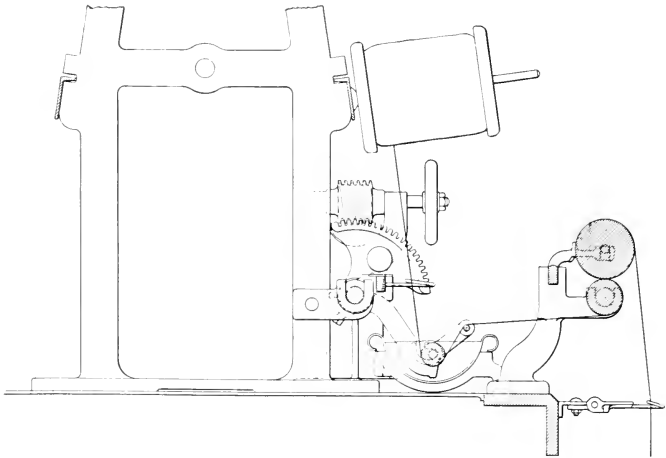
Spindle
with
Brake



Model D Gearing
Showing Ring Rail Wind-Down Motion

WET TWISTING

All of our different models of twisters may be arranged for **wet twisting** when so ordered. They are equipped with brass water troughs made in sections, with water tight couplings, and provided with a drainage outlet so that the water may be drawn off when desired. Each trough is fitted with revolvable brass immersion rolls held in open bearings of brass hangers supported by a shaft at back of trough. By a worm and gear arrangement connected to the shaft, the immersion rolls may be lifted out of the trough for cleaning purposes.



Trough-Roll Lifter

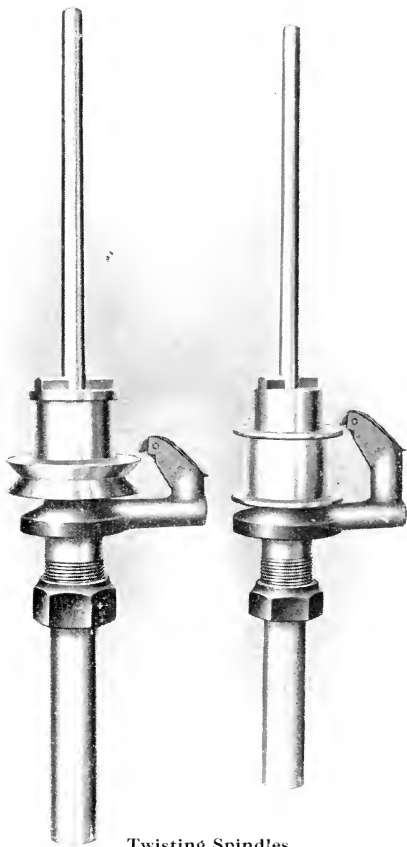
An adjustable **traverse motion** for preventing creasing of the rolls by the yarn is operated by means of a worm and gear driving a cam, thus giving a reciprocating motion to the guide rod. This rod located between the creel and trough is fitted with yarn guides of brass or of other non-corrosive material.

A single line of 1½-inch diameter bottom rolls with heavy top rolls is used. The bottom rolls are of steel covered with brass; the top rolls are made of cast iron, brass covered.

The thread boards may be of wood or metallic as desired, the guides, hinges and screws being of brass, thus preventing the formation of a rust that might stain the yarn.

TWISTING SPINDLES

Our twisting frames are usually equipped with the well-known Whitin Gravity type of Spindles fitted for either band or tape driving, and substantially constructed to withstand any work demanded of them. They are made in the following regular sizes, specifications of which are given on the following page.



Twisting Spindles

Light Gravity Spindle, used with rings up to 2" diameter.

Heavy Gravity Spindles, used with rings $1\frac{3}{4}$ " to $2\frac{1}{2}$ " diameter.

Extra Heavy Gravity Spindle No. 1, used with rings 2" to $2\frac{3}{4}$ " diameter.

Extra Heavy Gravity Spindle No. 2, used with rings 2" to $2\frac{3}{4}$ " diameter.

Extra Heavy Gravity Spindle No. 3, used with rings 3" to $3\frac{1}{2}$ " diameter.

Extra Heavy Gravity Spindle No. 4, used with rings 3" to $3\frac{1}{2}$ " diameter.

Extra Heavy Gravity Spindle No. 5, used with rings $3\frac{1}{2}$ " to 5" diameter.

Extra Heavy Gravity Spindle No. 6, used with rings $4\frac{3}{4}$ " to $6\frac{1}{2}$ " diameter.

Extra Heavy Gravity Spindle No. 8, used with rings $6\frac{1}{4}$ " to $7\frac{1}{4}$ " diameter.

RING TWISTING SPINDLES

| Spindle | Space | Diam. Ring | Width Tape |
|---|--|--|-----------------|
| Light Gravity Diam. Blade Bearing .362" Diam. Whirl $7\frac{7}{8}" - 1\frac{5}{16}" - 1"$ | $2\frac{3}{4}"$ | $1\frac{1}{4}"$ to $1\frac{3}{8}"$ $1\frac{1}{2}"$ to $1\frac{5}{8}"$ | $\frac{3}{4}"$ |
| Light Gravity Diam. Blade Bearing .362" Diam. Whirl $1\frac{1}{16}" - 1\frac{1}{8}"$ | $3"$ $3\frac{1}{4}"$ | $1\frac{3}{4}"$ to $2"$ $1\frac{3}{4}"$ to $2"$ | $\frac{3}{4}"$ |
| Heavy Diam. Blade Bearing .362" Diam. Whirl $1\frac{5}{16}"$ | $3"$ $3\frac{1}{4}"$ $3\frac{1}{2}"$ | $1\frac{3}{4}"$ to $2"$ $1\frac{3}{4}"$ to $2\frac{1}{4}"$ $2"$ to $2\frac{1}{2}"$ | $\frac{3}{4}"$ |
| Extra Heavy No. 1 Diam. Blade Bearing .426" Diam. Whirl $1\frac{5}{16}"$ | $3\frac{1}{2}"$ $3\frac{3}{4}"$ | $2"$ to $2\frac{1}{2}"$ $2\frac{1}{2}"$ to $2\frac{3}{4}"$ | $\frac{3}{4}"$ |
| Extra Heavy No. 2 Diam. Blade Bearing .426" Diam. Whirl $1\frac{5}{8}"$ | $3\frac{1}{2}"$ $3\frac{3}{4}"$ | $2"$ to $2\frac{1}{2}"$ $2\frac{1}{2}"$ to $2\frac{3}{4}"$ | $\frac{7}{8}"$ |
| Extra Heavy No. 3 Diam. Blade Bearing .500" Diam. Whirl $2"$ | $4"$ $4\frac{1}{2}"$ $5"$ | $3"$ $3"$ to $3\frac{1}{4}"$ $3\frac{1}{4}"$ to $3\frac{1}{2}"$ | $1\frac{1}{8}"$ |
| Extra Heavy No. 4 Diam. Blade Bearing .5625" Diam. Whirl $2\frac{1}{2}"$ | $4\frac{1}{2}"$ $5"$ | $3"$ to $3\frac{1}{4}"$ $3\frac{1}{2}"$ | $1\frac{1}{2}"$ |
| Extra Heavy No. 5 Diam. Blade Bearing .5625" Diam. Whirl $2\frac{1}{2}"$ | $5"$ $5\frac{1}{2}"$ $6"$ $6\frac{1}{2}"$ | $3\frac{1}{2}"$ $3\frac{3}{4}"$ to $4\frac{1}{4}"$ $4\frac{1}{4}"$ to $4\frac{1}{2}"$ $4\frac{3}{4}"$ to $5"$ | $1\frac{3}{4}"$ |
| Extra Heavy No. 6 Diam. Blade Bearing .6875" Diam. Whirl $3"$ | $6\frac{1}{2}"$ $7"$ $7\frac{1}{2}"$ $8"$ | $4\frac{3}{4}"$ to $5"$ $5\frac{1}{4}"$ to $5\frac{1}{2}"$ $5\frac{3}{4}"$ to $6"$ $6\frac{1}{4}"$ to $6\frac{1}{2}"$ | $1\frac{3}{4}"$ |
| Extra Heavy No. 8 Diam. Blade Bearing .875" Diam. Whirl $4"$ | $8"$ $8\frac{1}{2}"$ $9"$ | $6\frac{1}{4}"$ to $6\frac{1}{2}"$ $6\frac{3}{4}"$ to $7"$ $7"$ to $7\frac{1}{4}"$ | $1\frac{3}{4}"$ |

TWISTING RINGS



**Band
Ring**



**Deep
Vertical
Ring**



**Narrow
Vertical Ring**

Our twisting frames are usually equipped with rings of our own make. They are made of the best quality of steel, highly polished, with a hard lustrous finish which presents a suitable bearing surface for the traveler. We can furnish standard sizes of double adjustable, band or vertical type of rings fitted in any style of plate holder desired for both wet or dry twisting.



**Band
Ring
in Plate
Holder.**

Notice

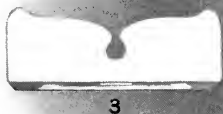
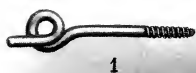
Our customers will avoid delay and the possibility of mistakes by sending sample rings and holders with their orders. We carry an extensive stock of finished rings, and are prepared to fill promptly orders for any of the standard sizes.

WHITIN TWISTERS

Shipping Weights Per Foot in Length:

| | Model A | Model B | Model D |
|---------------------|----------|----------|----------|
| Domestic Net..... | 230 lbs. | 296 lbs. | 416 lbs. |
| Domestic Gross..... | 260 lbs. | 312 lbs. | 446 lbs. |
| Export Gross..... | 300 lbs. | 346 lbs. | 502 lbs. |
| Cubic Feet..... | 6.8 | 7.8 | 10.1 |

TWISTER THREAD GUIDES



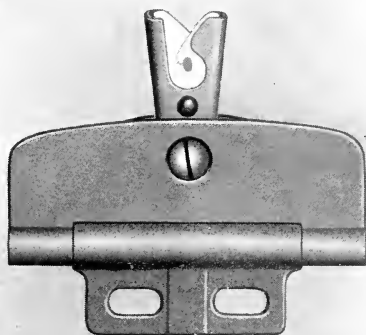
TWISTER THREAD GUIDES



9



10



11.



12

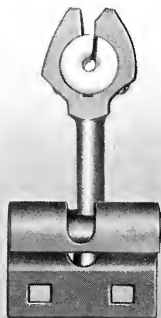


13

TWISTER THREAD GUIDES



14



15



16



17



18



19



20

WHITIN TWISTER.

Floor Space:—Width 39 inches and lengths over all for Model B Tape Drive Frames are as follows.

| Number of Spindles | 6 inch | | 5½ inch | | 5 inch | | 4½ inch | | 4 inch | | 3¾ inch | | 3½ inch | | 3¼ inch | | 3 inch | | 2¾ inch | | Number of Spindles |
|--------------------|--------|-----|---------|-----|--------|-----|---------|-----|--------|-----|---------|-----|---------|-----|---------|-----|--------|-----|---------|-----|--------------------|
| | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. | |
| 60 | 17 | 6 | 16 | 3 | 15 | 0 | 13 | 9 | 12 | 6 | 11 | 11 | 11 | 3 | 10 | 8 | 10 | 0 | 9 | 5 | 60 |
| 64 | 18 | 6 | 17 | 2 | 15 | 10 | 14 | 6 | 13 | 2 | 12 | 6 | 11 | 10 | 11 | 2 | 10 | 6 | 9 | 10 | 64 |
| 72 | 20 | 6 | 19 | 0 | 17 | 6 | 16 | 0 | 14 | 6 | 13 | 9 | 13 | 0 | 12 | 3 | 11 | 6 | 10 | 9 | 72 |
| 80 | 22 | 6 | 20 | 10 | 19 | 2 | 17 | 6 | 15 | 10 | 15 | 0 | 14 | 2 | 13 | 4 | 12 | 6 | 11 | 8 | 80 |
| 84 | 23 | 6 | 21 | 9 | 20 | 0 | 18 | 3 | 16 | 6 | 15 | 8 | 14 | 9 | 13 | 11 | 13 | 0 | 12 | 2 | 84 |
| 88 | 24 | 6 | 22 | 8 | 20 | 10 | 19 | 0 | 17 | 2 | 16 | 5 | 14 | 4 | 14 | 5 | 13 | 6 | 12 | 7 | 88 |
| 96 | 26 | 6 | 24 | 6 | 22 | 6 | 20 | 6 | 18 | 6 | 17 | 6 | 16 | 6 | 15 | 6 | 14 | 6 | 13 | 6 | 96 |
| 104 | 28 | 6 | 26 | 4 | 24 | 2 | 22 | 9 | 19 | 10 | 18 | 9 | 17 | 8 | 16 | 7 | 15 | 6 | 14 | 5 | 104 |
| 108 | 29 | 6 | 27 | 3 | 25 | 0 | 22 | 9 | 20 | 6 | 19 | 5 | 18 | 3 | 17 | 2 | 16 | 0 | 14 | 11 | 108 |
| 112 | 30 | 6 | 28 | 2 | 25 | 10 | 23 | 6 | 21 | 2 | 20 | 0 | 18 | 10 | 17 | 8 | 16 | 6 | 15 | 4 | 112 |
| 120 | 32 | 6 | 30 | 0 | 27 | 6 | 25 | 0 | 22 | 6 | 21 | 3 | 20 | 0 | 18 | 9 | 17 | 6 | 16 | 3 | 120 |
| 128 | 34 | 6 | 31 | 10 | 29 | 2 | 26 | 6 | 23 | 10 | 22 | 6 | 21 | 2 | 19 | 10 | 18 | 6 | 17 | 2 | 128 |
| 132 | 35 | 6 | 33 | 2 | 30 | 0 | 27 | 3 | 24 | 6 | 23 | 2 | 21 | 9 | 20 | 5 | 19 | 0 | 17 | 8 | 132 |
| 144 | 38 | 6 | 35 | 6 | 32 | 6 | 29 | 6 | 26 | 6 | 25 | 0 | 23 | 6 | 22 | 0 | 20 | 6 | 19 | 0 | 144 |
| 160 | 42 | 6 | 39 | 2 | 35 | 10 | 32 | 6 | 29 | 2 | 27 | 6 | 25 | 10 | 24 | 2 | 22 | 6 | 20 | 10 | 160 |
| 168 | | | 41 | 0 | 37 | 6 | 34 | 0 | 30 | 6 | 28 | 9 | 27 | 0 | 25 | 3 | 23 | 6 | 21 | 9 | 168 |
| 176 | | | | | 39 | 2 | 35 | 6 | 31 | 10 | 30 | 0 | 28 | 2 | 26 | 4 | 24 | 6 | 22 | 8 | 176 |
| 192 | | | | | 42 | | 38 | 6 | 34 | 6 | 32 | 6 | 30 | 6 | 28 | 6 | 26 | 6 | 24 | 6 | 192 |
| 208 | | | | | | 6 | 41 | | 37 | 2 | 35 | 0 | 32 | 10 | 30 | 8 | 28 | 6 | 26 | 4 | 208 |
| 216 | | | | | | | | | 38 | 6 | 36 | 3 | 34 | 0 | 31 | 9 | 29 | 6 | 27 | 3 | 216 |
| 224 | | | | | | | | | 39 | 10 | 37 | 6 | 35 | 2 | 32 | 10 | 30 | 6 | 28 | 2 | 224 |
| 240 | | | | | | | | | 42 | 6 | 40 | 0 | 37 | 6 | 35 | 0 | 32 | 6 | 30 | 0 | 240 |
| 256 | | | | | | | | | | | 42 | | 42 | | 40 | | 34 | 6 | 31 | 9½ | 256 |
| 272 | | | | | | | | | | | | | | | 39 | 4 | 36 | 6 | 33 | 8 | 272 |
| 280 | | | | | | | | | | | | | | | 40 | 5 | 37 | 6 | 34 | 7 | 280 |
| 288 | | | | | | | | | | | | | | | | | 38 | 6 | 35 | 6 | 288 |
| 292 | | | | | | | | | | | | | | | | | 39 | 0 | 36 | 0 | 292 |

Above Lengths are for 3-inch Face Pulley:—3½-inch Face, add 1 inch—4-inch Face, add 2 inches. When Belted at Head End subtract 2 inches from above Lengths;—Model A Band Drive Frames are 6 inches shorter than Lengths given above, and are built in 36-inch and 39-inch widths.

Overall Lengths of Model C.

42" HEAVY RING TWISTER

Foot End Drive Only

Lengths Given Are For 4¼" Face Pulleys. For 6¼" Face Pulleys add 4"

| Number of Spindles | 5-inch Space | | 5½-inch Space | | 6-inch Space | | 6½-inch Space | |
|--------------------------|-----------------|-----|------------------|-----|-----------------|-----|------------------|-----|
| | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. |
| 32 | 10 | 2 | 10 | 10 | | | 12 | 2 |
| 36 | 11 | 0 | 11 | 9 | 12 | 6 | 13 | 3 |
| 40 | 11 | 10 | 12 | 8 | 13 | 6 | 14 | 4 |
| 44 | 12 | 8 | 13 | 7 | 14 | 6 | 15 | 5 |
| 48 | 13 | 6 | 14 | 6 | 15 | 6 | 16 | 6 |
| 52 | 14 | 4 | 15 | 5 | 16 | 6 | 17 | 7 |
| 56 | 15 | 2 | 16 | 4 | 17 | 6 | 18 | 8 |
| 60 | 16 | 0 | 17 | 3 | 18 | 6 | 19 | 9 |
| 64 | 16 | 10 | 18 | 2 | 19 | 6 | 20 | 10 |
| 68 | 17 | 8 | 19 | 1 | 20 | 6 | 21 | 11 |
| 72 | 18 | 6 | 20 | 0 | 21 | 6 | 23 | 0 |
| 76 | 19 | 4 | 20 | 11 | 22 | 6 | 24 | 1 |
| 80 | 20 | 2 | 21 | 10 | 23 | 6 | 25 | 2 |
| 84 | 21 | 0 | 22 | 9 | 24 | 6 | 26 | 3 |
| 88 | 21 | 10 | 23 | 8 | 25 | 6 | 27 | 4 |
| 92 | 22 | 8 | 24 | 7 | 26 | 6 | 28 | 5 |
| 96 | 23 | 6 | 25 | 6 | 27 | 6 | 29 | 6 |
| 100 | 24 | 4 | 26 | 5 | 28 | 6 | 30 | 7 |
| 104 | 25 | 2 | 27 | 4 | 29 | 6 | 31 | 8 |
| 108 | 26 | 0 | 28 | 3 | 30 | 6 | 32 | 9 |
| 112 | 26 | 10 | 29 | 2 | 31 | 6 | 33 | 10 |
| 116 | 27 | 8 | 30 | 1 | 32 | 6 | 34 | 11 |
| 120 | 28 | 6 | 31 | 0 | 33 | 6 | 36 | 0 |
| 124 | 29 | 4 | 31 | 11 | 34 | 6 | 37 | 1 |
| 128 | 30 | 2 | 32 | 10 | 35 | 6 | 38 | 2 |
| 132 | 31 | 0 | 33 | 9 | 36 | 6 | 39 | 3 |
| 136 | 31 | 10 | 34 | 8 | 37 | 6 | 40 | 4 |
| 140 | 32 | 8 | 35 | 7 | 38 | 6 | 41 | 5 |
| 144 | 33 | 6 | 36 | 6 | 39 | 6 | 42 | 6 |
| 148 | 34 | 4 | 37 | 5 | 40 | 6 | | |
| 152 | 35 | 2 | 38 | 4 | 41 | 6 | | |
| 156 | 36 | 0 | 39 | 3 | 42 | 6 | | |
| 160 | 36 | 10 | 40 | 2 | | | | |
| 164 | 37 | 8 | 41 | 1 | | | | |
| 168 | 38 | 6 | 42 | 0 | | | | |
| 172 | 39 | 4 | | | | | | |
| 176 | 40 | 2 | | | | | | |
| 180 | 41 | 0 | | | | | | |
| 184 | 41 | 10 | | | | | | |

Overall Lengths of Model D

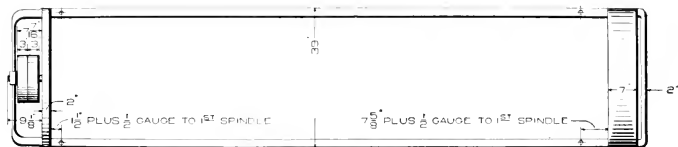
42" EXTRA HEAVY RING TWISTER

Foot End Drive Only

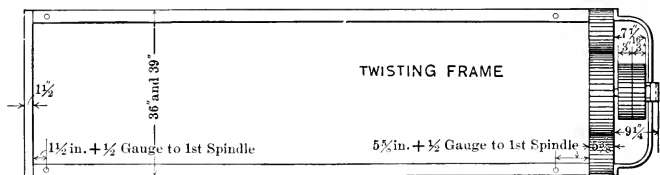
Lengths Given Are For 4¼" Face Pulleys. For 6¼" Face Pulleys add 4"

| No. of Spl. | 6½" Space | | 7" Space | | 7½" Space | | 8" Space | | 8½" Space | | 9" Space | | 9½" Space | | 10" Space | |
|-------------------|-----------|-----|----------|-----|-----------|-----|----------|-----|-----------|-----|----------|-----|-----------|-----|-----------|-----|
| | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. | Ft. | In. |
| 32 | 12 | 3 | 12 | 11 | 13 | 7 | 14 | 3 | 14 | 11 | 15 | 7 | 16 | 3 | 16 | 11 |
| 36 | 13 | 4 | 14 | 1 | 14 | 10 | 15 | 7 | 16 | 4 | 17 | 1 | 17 | 10 | 18 | 7 |
| 40 | 14 | 5 | 15 | 3 | 16 | 1 | 16 | 11 | 17 | 9 | 18 | 7 | 19 | 5 | 20 | 3 |
| 44 | 15 | 6 | 16 | 5 | 17 | 4 | 18 | 3 | 19 | 2 | 20 | 1 | 21 | 0 | 21 | 11 |
| 48 | 16 | 7 | 17 | 7 | 18 | 7 | 19 | 7 | 20 | 7 | 21 | 7 | 22 | 7 | 23 | 7 |
| 52 | 17 | 8 | 18 | 9 | 19 | 10 | 20 | 11 | 22 | 0 | 23 | 1 | 24 | 2 | 25 | 3 |
| 56 | 18 | 9 | 19 | 11 | 21 | 1 | 22 | 3 | 23 | 5 | 24 | 7 | 25 | 9 | 26 | 11 |
| 60 | 19 | 10 | 21 | 1 | 22 | 4 | 23 | 7 | 24 | 10 | 26 | 1 | 27 | 4 | 28 | 7 |
| 64 | 20 | 11 | 22 | 3 | 23 | 7 | 24 | 11 | 26 | 3 | 27 | 7 | 28 | 11 | 30 | 3 |
| 68 | 22 | 0 | 23 | 5 | 24 | 10 | 26 | 3 | 27 | 8 | 29 | 1 | 30 | 6 | 31 | 11 |
| 72 | 23 | 1 | 24 | 7 | 26 | 1 | 27 | 7 | 29 | 1 | 30 | 7 | 32 | 1 | 33 | 7 |
| 76 | 24 | 2 | 25 | 9 | 27 | 4 | 28 | 11 | 30 | 6 | 32 | 1 | 33 | 8 | 35 | 3 |
| 80 | 25 | 3 | 26 | 11 | 28 | 7 | 30 | 3 | 31 | 11 | 33 | 7 | 35 | 3 | 36 | 11 |
| 84 | 26 | 4 | 28 | 1 | 29 | 10 | 31 | 7 | 33 | 4 | 35 | 1 | 36 | 10 | 38 | 7 |
| 88 | 27 | 5 | 29 | 3 | 31 | 1 | 32 | 11 | 34 | 9 | 36 | 7 | 38 | 5 | 40 | 3 |
| 92 | 28 | 6 | 30 | 5 | 32 | 4 | 34 | 3 | 36 | 2 | 38 | 1 | 40 | 0 | 41 | 11 |
| 96 | 29 | 7 | 31 | 7 | 33 | 7 | 35 | 7 | 37 | 7 | 39 | 7 | 41 | 7 | 43 | 7 |
| 100 | 30 | 8 | 32 | 9 | 34 | 10 | 36 | 11 | 39 | 0 | 41 | 1 | 43 | 2 | | |
| 104 | 31 | 9 | 33 | 11 | 36 | 1 | 38 | 3 | 40 | 5 | 42 | 7 | | | | |
| 108 | 32 | 10 | 35 | 1 | 37 | 4 | 39 | 7 | 41 | 10 | | | | | | |
| 112 | 33 | 11 | 36 | 3 | 38 | 7 | 40 | 11 | 43 | 3 | | | | | | |
| 116 | 35 | 0 | 37 | 5 | 39 | 10 | 42 | 3 | | | | | | | | |
| 120 | 36 | 1 | 38 | 7 | 41 | 1 | | | | | | | | | | |
| 124 | 37 | 2 | 39 | 9 | 42 | 4 | | | | | | | | | | |
| 128 | 38 | 3 | 40 | 11 | | | | | | | | | | | | |
| 132 | 39 | 4 | 42 | 1 | | | | | | | | | | | | |
| 136 | 40 | 5 | | | | | | | | | | | | | | |
| 140 | 41 | 6 | | | | | | | | | | | | | | |
| 144 | 42 | 7 | | | | | | | | | | | | | | |

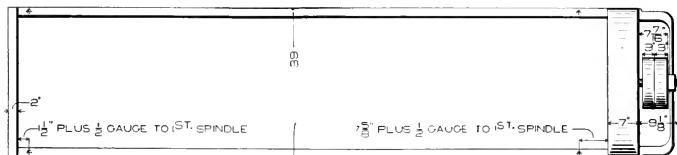
FLOOR PLAN OF TWISTERS



**Model B, Tape Drive Spindles,
Foot End Drive.**

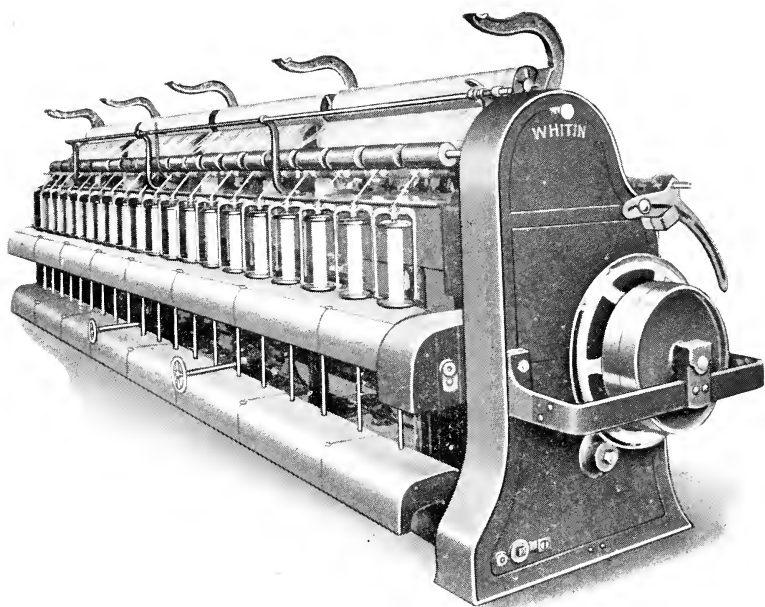


**Model A, Band Drive Spindles,
Head End Drive.**



**Model B, Tape Drive Spindles,
Head End Drive.**

Rule for finding the overall lengths of Model B frames: Number spindles $\div 2 \times$ gauge $\times 29 \frac{1}{4}$ = length in inches of frame with 3 inch face pulleys.



FLYER TWISTER

The machine illustrated is designed to twist coarse yarns from roving spools made on a condenser card, but machines of this type can be made with creels for bobbins or cheeses if so ordered. The machine is built with direct-weighted or self-balanced rails as preferred. The flyers are of the best quality of polished steel, evenly balanced and free from vibration. A line of steel bottom rolls with a single line of heavy top-rolls is used.

**Weight per foot in length
with self-balanced rails:**

Domestic:

Net, 291 pounds,
Gross, 326 pounds.

Export:

Gross, 367 pounds,
Cubic Feet 9.

BAND DRIVE Twister Speed Table.

Giving Revolutions per Minute of 7 Inch Cylinder Required to
Produce Various Spindle Speeds.

| Revolutions per Minute of 7 inch Cylinder with | | | | | | | | | | |
|--|--|---|----------------------------|--|---|--|---|---|----------------------------|---|
| R.P.M. OF SPINDLES | $\frac{3}{8}$ inch Whirl Ratio 7.25 | $1\frac{1}{8}$ inch Whirl Ratio 6.62 | 1 inch Whirl Ratio 6.24 | $1\frac{1}{16}$ inch Whirl Ratio 5.86 | $1\frac{1}{4}$ inch Whirl Ratio 5.43 | $1\frac{5}{16}$ inch Whirl Ratio 4.80 | $1\frac{3}{8}$ inch Whirl Ratio 3.80 | $1\frac{1}{2}$ inch Whirl Ratio 3.70 | 2 inch Whirl Ratio 3.41 | $2\frac{1}{2}$ inch Whirl Ratio 2.66 |
| 3000 | | | | | | 625 | 789 | 811 | 880 | 1128 |
| 3100 | | | | | | 646 | 816 | 838 | 909 | 1165 |
| 3200 | | | | | | 667 | 842 | 865 | 938 | 1203 |
| 3300 | | | | | | 688 | 868 | 892 | 968 | 1241 |
| 3400 | | | | | | 708 | 895 | 919 | 997 | 1278 |
| 3500 | | | | | 645 | 729 | 921 | 946 | 1026 | 1316 |
| 3600 | | | | | 663 | 750 | 947 | 973 | 1056 | 1353 |
| 3700 | | | | | 681 | 771 | 974 | 1000 | 1085 | 1391 |
| 3800 | | | | | 700 | 792 | 1000 | 1027 | 1114 | 1428 |
| 3900 | | | | | 718 | 813 | 1026 | 1054 | 1144 | 1466 |
| 4000 | | | | 683 | 737 | 833 | 1053 | 1081 | 1173 | |
| 4100 | | | | 700 | 755 | 854 | 1079 | 1108 | 1202 | |
| 4200 | | | | 717 | 773 | 875 | 1105 | 1135 | 1232 | |
| 4300 | | | | 734 | 792 | 896 | 1132 | 1162 | 1261 | |
| 4400 | | | | 751 | 810 | 917 | 1158 | 1189 | 1290 | |
| 4500 | | | 721 | 768 | 829 | 938 | 1184 | 1216 | 1319 | |
| 4600 | | | 737 | 785 | 847 | 958 | 1211 | 1243 | 1349 | |
| 4700 | | | 753 | 802 | 866 | 979 | 1237 | 1270 | 1378 | |
| 4800 | | | 769 | 819 | 884 | 1000 | 1263 | 1297 | 1408 | |
| 4900 | | | 781 | 836 | 902 | 1021 | 1289 | 1324 | 1436 | |
| 5000 | | 755 | 801 | 853 | 921 | 1042 | 1316 | 1351 | | |
| 5100 | | 770 | 817 | 870 | 939 | 1063 | 1342 | 1378 | | |
| 5200 | | 785 | 833 | 887 | 957 | 1083 | 1368 | 1405 | | |
| 5300 | | 801 | 849 | 904 | 976 | 1104 | 1395 | 1432 | | |
| 5400 | | 816 | 865 | 921 | 994 | 1125 | 1421 | 1459 | | |
| 5500 | 759 | 831 | 881 | 938 | 1013 | 1146 | | | | |
| 5600 | 772 | 846 | 897 | 956 | 1031 | 1167 | | | | |
| 5700 | 786 | 861 | 913 | 973 | 1050 | 1188 | | | | |
| 5800 | 800 | 876 | 929 | 990 | 1068 | 1208 | | | | |
| 5900 | 814 | 891 | 946 | 1007 | 1087 | 1224 | | | | |
| 6000 | 828 | 906 | 962 | 1024 | 1105 | 1250 | | | | |
| 6100 | 841 | 921 | 978 | 1041 | 1123 | 1271 | | | | |
| 6200 | 855 | 936 | 994 | 1058 | 1142 | 1292 | | | | |
| 6300 | 869 | 952 | 1010 | 1075 | 1160 | 1313 | | | | |
| 6400 | 883 | 967 | 1026 | 1092 | 1179 | 1333 | | | | |

BAND DRIVE

Twister Speed Table.

Giving Revolutions per Minute of 7 Inch Cylinder Required to
Produce Various Spindle Speeds.

| R.P.M. OF SPINDLES | Revolutions per Minute of 7 inch Cylinder with | | | | | | | |
|-----------------------|--|---|----------------------------|--|---|--|---|---|
| | $\frac{7}{8}$ inch Whirl Ratio 7.25 | $1\frac{1}{8}$ inch Whirl Ratio 6.62 | 1 inch Whirl Ratio 6.24 | $1\frac{1}{16}$ inch Whirl Ratio 5.86 | $1\frac{1}{8}$ inch Whirl Ratio 5.43 | $1\frac{5}{16}$ inch Whirl Ratio 4.80 | $1\frac{3}{4}$ inch Whirl Ratio 3.80 | $1\frac{1}{2}$ inch Whirl Ratio 3.70 |
| 6500 | 897 | 982 | 1042 | 1109 | 1197 | 1354 | | |
| 6600 | 910 | 997 | 1058 | 1126 | 1215 | 1375 | | |
| 6700 | 924 | 1012 | 1074 | 1143 | 1234 | 1396 | | |
| 6800 | 938 | 1027 | 1090 | 1160 | 1252 | 1417 | | |
| 6900 | 952 | 1042 | 1106 | 1177 | 1271 | 1438 | | |
| 7000 | 966 | 1057 | 1122 | 1195 | 1289 | | | |
| 7100 | 979 | 1072 | 1138 | 1212 | 1308 | | | |
| 7200 | 993 | 1088 | 1154 | 1229 | 1326 | | | |
| 7300 | 1007 | 1103 | 1170 | 1246 | 1344 | | | |
| 7400 | 1021 | 1118 | 1186 | 1263 | 1363 | | | |
| 7500 | 1034 | 1133 | 1202 | 1280 | 1381 | | | |
| 7600 | 1048 | 1148 | 1218 | 1297 | 1400 | | | |
| 7700 | 1062 | 1163 | 1234 | 1314 | 1418 | | | |
| 7800 | 1076 | 1178 | 1250 | 1331 | 1436 | | | |
| 7900 | 1090 | 1193 | 1266 | 1348 | 1455 | | | |
| 8000 | 1103 | 1208 | 1282 | 1365 | | | | |
| 8100 | 1117 | 1223 | 1298 | 1382 | | | | |
| 8200 | 1131 | 1239 | 1314 | 1399 | | | | |
| 8300 | 1145 | 1254 | 1330 | 1416 | | | | |
| 8400 | 1159 | 1269 | 1346 | 1433 | | | | |
| 8500 | 1172 | 1284 | 1362 | | | | | |
| 8600 | 1186 | 1299 | 1378 | | | | | |
| 8700 | 1200 | 1314 | 1394 | | | | | |
| 8800 | 1214 | 1329 | 1410 | | | | | |
| 8900 | 1228 | 1344 | 1426 | | | | | |
| 9000 | 1241 | 1360 | | | | | | |
| 9100 | 1255 | 1375 | | | | | | |
| 9200 | 1269 | 1390 | | | | | | |
| 9300 | 1283 | 1405 | | | | | | |
| 9400 | 1297 | 1420 | | | | | | |
| 9500 | 1310 | | | | | | | |
| 9600 | 1324 | | | | | | | |
| 9700 | 1338 | | | | | | | |
| 9800 | 1352 | | | | | | | |
| 9900 | 1366 | | | | | | | |
| 10000 | 1379 | | | | | | | |

BAND DRIVE Twister Speed Table.

Giving Revolutions per Minute of 8 Inch Cylinder Required to
Produce Various Spindle Speeds.

| R. P. M. OF SPINDLES | Revolutions per Minute of 8 inch Cylinder with | | | | | | | |
|-------------------------|--|---|----------------------------|--|---|---|---|---|
| | $\frac{7}{8}$ inch Whirl Ratio 8.28 | $1\frac{1}{8}$ inch Whirl Ratio 7.67 | 1 inch Whirl Ratio 7.08 | $1\frac{1}{16}$ inch Whirl Ratio 6.80 | $1\frac{1}{4}$ inch Whirl Ratio 6.62 | $1\frac{5}{8}$ inch Whirl Ratio 5.48 | $1\frac{3}{4}$ inch Whirl Ratio 4.37 | $1\frac{7}{8}$ inch Whirl Ratio 4.12 |
| 3000 | | | | | | 547 | 686 | 728 |
| 3100 | | | | | | 566 | 709 | 752 |
| 3200 | | | | | | 584 | 732 | 776 |
| 3300 | | | | | | 602 | 755 | 800 |
| 3400 | | | | | | 620 | 778 | 825 |
| 3500 | | | | | 563 | 639 | 800 | 849 |
| 3600 | | | | | 579 | 657 | 824 | 874 |
| 3700 | | | | | 595 | 675 | 847 | 898 |
| 3800 | | | | | 611 | 693 | 870 | 922 |
| 3900 | | | | | 627 | 712 | 892 | 947 |
| 4000 | | | | 588 | 643 | 730 | 915 | 971 |
| 4100 | | | | 603 | 659 | 748 | 938 | 995 |
| 4200 | | | | 618 | 675 | 766 | 960 | 1019 |
| 4300 | | | | 632 | 691 | 785 | 983 | 1044 |
| 4400 | | | | 647 | 707 | 803 | 1007 | 1068 |
| 4500 | | | 636 | 662 | 723 | 821 | 1030 | 1092 |
| 4600 | | | 650 | 676 | 740 | 840 | 1053 | 1117 |
| 4700 | | | 664 | 691 | 756 | 858 | 1076 | 1141 |
| 4800 | | | 678 | 706 | 772 | 876 | 1098 | 1165 |
| 4900 | | | 692 | 721 | 788 | 894 | 1121 | 1189 |
| 5000 | | 652 | 706 | 735 | 804 | 912 | 1144 | 1214 |
| 5100 | | 665 | 720 | 750 | 820 | 930 | 1167 | 1238 |
| 5200 | | 678 | 734 | 765 | 836 | 949 | 1190 | 1262 |
| 5300 | | 691 | 749 | 779 | 852 | 967 | 1213 | 1286 |
| 5400 | | 704 | 761 | 794 | 868 | 985 | 1236 | 1311 |
| 5500 | 664 | 717 | 777 | 809 | 884 | 1004 | 1259 | 1335 |
| 5600 | 676 | 730 | 791 | 824 | 900 | 1022 | 1281 | 1359 |
| 5700 | 688 | 743 | 805 | 838 | 916 | 1040 | 1304 | 1383 |
| 5800 | 700 | 756 | 819 | 853 | 932 | 1058 | 1327 | 1408 |
| 5900 | 712 | 768 | 833 | 868 | 949 | 1077 | 1350 | 1432 |
| 6000 | 725 | 782 | 847 | 882 | 965 | 1095 | 1373 | |
| 6100 | 737 | 795 | 862 | 897 | 981 | 1113 | 1396 | |
| 6200 | 748 | 808 | 876 | 912 | 997 | 1131 | 1419 | |
| 6300 | 761 | 821 | 890 | 926 | 1013 | 1150 | 1442 | |
| 6400 | 773 | 834 | 904 | 941 | 1029 | 1168 | 1465 | |

BAND DRIVE Twister Speed Table.

Giving Revolutions per Minute of 8 Inch Cylinder Required to
Produce Various Spindle Speeds.

| R.P.M. OF SPINDLES | Revolutions per Minute of 8 inch Cylinder with | | | | | | | |
|-----------------------|--|--|----------------------------|--|---|--|---|---|
| | $\frac{5}{8}$ inch Whirl Ratio 8.28 | $\frac{11}{16}$ inch Whirl Ratio 7.67 | 1 inch Whirl Ratio 7.08 | $1\frac{1}{16}$ inch Whirl Ratio 6.80 | $1\frac{1}{8}$ inch Whirl Ratio 6.22 | $1\frac{5}{16}$ inch Whirl Ratio 5.48 | $1\frac{3}{8}$ inch Whirl Ratio 4.37 | $1\frac{1}{2}$ inch Whirl Ratio 4.12 |
| 6500 | 785 | 847 | 918 | 956 | 1045 | 1186 | | |
| 6600 | 797 | 860 | 932 | 971 | 1061 | 1205 | | |
| 6700 | 809 | 874 | 946 | 985 | 1077 | 1223 | | |
| 6800 | 821 | 887 | 961 | 1000 | 1093 | 1241 | | |
| 6900 | 833 | 900 | 985 | 1014 | 1109 | 1259 | | |
| 7000 | 845 | 913 | 989 | 1029 | 1125 | 1277 | | |
| 7100 | 857 | 926 | 1003 | 1044 | 1141 | 1296 | | |
| 7200 | 870 | 939 | 1017 | 1059 | 1158 | 1314 | | |
| 7300 | 882 | 952 | 1031 | 1074 | 1172 | 1332 | | |
| 7400 | 894 | 965 | 1045 | 1088 | 1190 | 1350 | | |
| 7500 | 906 | 978 | 1059 | 1103 | 1206 | 1369 | | |
| 7600 | 918 | 991 | 1073 | 1118 | 1222 | 1387 | | |
| 7700 | 930 | 1004 | 1088 | 1132 | 1238 | 1405 | | |
| 7800 | 942 | 1017 | 1102 | 1147 | 1254 | 1423 | | |
| 7900 | 954 | 1030 | 1116 | 1162 | 1270 | 1442 | | |
| 8000 | 966 | 1043 | 1130 | 1176 | 1286 | | | |
| 8100 | 978 | 1056 | 1144 | 1191 | 1302 | | | |
| 8200 | 990 | 1069 | 1158 | 1206 | 1318 | | | |
| 8300 | 1002 | 1082 | 1172 | 1221 | 1334 | | | |
| 8400 | 1014 | 1095 | 1186 | 1235 | 1350 | | | |
| 8500 | 1027 | 1108 | 1201 | 1250 | 1367 | | | |
| 8600 | 1039 | 1121 | 1215 | 1265 | 1383 | | | |
| 8700 | 1051 | 1134 | 1229 | 1279 | 1399 | | | |
| 8800 | 1063 | 1147 | 1243 | 1294 | 1415 | | | |
| 8900 | 1075 | 1160 | 1257 | 1309 | 1431 | | | |
| 9000 | 1087 | 1173 | 1271 | 1324 | | | | |
| 9100 | 1099 | 1186 | 1285 | 1338 | | | | |
| 9200 | 1111 | 1199 | 1299 | 1353 | | | | |
| 9300 | 1123 | 1213 | 1314 | 1368 | | | | |
| 9400 | 1135 | 1226 | 1328 | 1382 | | | | |
| 9500 | 1147 | 1239 | 1342 | 1397 | | | | |
| 9600 | 1159 | 1252 | 1356 | 1412 | | | | |
| 9700 | 1171 | 1265 | 1370 | 1426 | | | | |
| 9800 | 1183 | 1278 | 1384 | 1441 | | | | |
| 9900 | 1195 | 1291 | 1398 | 1456 | | | | |
| 10000 | 1208 | 1304 | 1412 | 1471 | | | | |

TAPE DRIVE TWISTER

SPEED TABLE

Giving Revolutions per Minute of 7" Cylinder Required to Produce Various Spindle Speeds

| R. P. M. OF SPINDLES | Revolutions per Minute of 7" Cylinder with | | | | | | | | | |
|-------------------------|--|---|----------------------------|---|---|---|--|---|----------------------------|---|
| | $\frac{7}{8}$ inch Whirl Ratio 7.8 | $1\frac{1}{8}$ inch Whirl Ratio 7.27 | 1 inch Whirl Ratio 6.81 | $1\frac{1}{4}$ inch Whirl Ratio 6.43 | $1\frac{3}{4}$ inch Whirl Ratio 6.09 | $1\frac{5}{8}$ inch Whirl Ratio 5.22 | $1\frac{3}{2}$ inch Whirl Ratio 4.2 | $1\frac{1}{2}$ inch Whirl Ratio 3.93 | 2 inch Whirl Ratio 3.51 | $2\frac{1}{2}$ inch Whirl Ratio 2.76 |
| 3000 | ... | ... | ... | ... | ... | 574 | 714 | 763 | 853 | 1086 |
| 3100 | ... | ... | ... | ... | ... | 594 | 738 | 789 | 883 | 1123 |
| 3200 | ... | ... | ... | ... | ... | 613 | 762 | 815 | 912 | 1160 |
| 3300 | ... | ... | ... | ... | ... | 632 | 785 | 840 | 940 | 1196 |
| 3400 | ... | ... | ... | ... | ... | 651 | 809 | 865 | 98 | 1232 |
| 3500 | ... | ... | ... | ... | 575 | 670 | 833 | 891 | 996 | 1268 |
| 3600 | ... | ... | ... | ... | 592 | 689 | 857 | 916 | 1025 | 1304 |
| 3700 | ... | ... | ... | ... | 608 | 719 | 881 | 942 | 1053 | 1340 |
| 3800 | ... | ... | ... | ... | 624 | 728 | 905 | 967 | 1082 | 1376 |
| 3900 | ... | ... | ... | ... | 641 | 747 | 929 | 993 | 1111 | 1412 |
| 4000 | ... | ... | ... | 622 | 657 | 766 | 952 | 1017 | 1139 | |
| 4100 | ... | ... | ... | 637 | 674 | 785 | 976 | 1043 | 1167 | |
| 4200 | ... | ... | ... | 653 | 690 | 804 | 1000 | 1069 | 1196 | |
| 4300 | ... | ... | ... | 668 | 706 | 823 | 1024 | 1094 | 1225 | |
| 4400 | ... | ... | ... | 684 | 722 | 842 | 1048 | 1120 | 1253 | |
| 4500 | ... | ... | 661 | 699 | 739 | 861 | 1072 | 1145 | 1282 | |
| 4600 | ... | ... | 676 | 715 | 756 | 881 | 1095 | 1171 | 1311 | |
| 4700 | ... | ... | 691 | 731 | 773 | 900 | 1119 | 1196 | 1339 | |
| 4800 | ... | ... | 704 | 746 | 788 | 919 | 1143 | 1222 | 1368 | |
| 4900 | ... | ... | 720 | 762 | 804 | 938 | 1167 | 1247 | 1396 | |
| 5000 | ... | 688 | 735 | 777 | 821 | 957 | 1191 | 1272 | | |
| 5100 | ... | 701 | 750 | 792 | 838 | 976 | 1214 | 1298 | | |
| 5200 | ... | 715 | 765 | 808 | 854 | 996 | 1238 | 1323 | | |
| 5300 | ... | 729 | 779 | 824 | 871 | 1015 | 1262 | 1349 | | |
| 5400 | ... | 742 | 794 | 840 | 888 | 1034 | 1286 | 1365 | | |
| 5500 | 705 | 756 | 809 | 855 | 904 | 1053 | 1310 | | | |
| 5600 | 718 | 770 | 824 | 871 | 920 | 1071 | 1334 | | | |
| 5700 | 731 | 784 | 838 | 888 | 937 | 1091 | 1357 | | | |
| 5800 | 743 | 798 | 852 | 902 | 953 | 1111 | 1381 | | | |
| 5900 | 756 | 811 | 867 | 917 | 970 | 1121 | 1405 | | | |
| 6000 | 769 | 825 | 882 | 932 | 986 | 1145 | 1429 | | | |
| 6100 | 782 | 839 | 897 | 948 | 1002 | 1164 | 1452 | | | |
| 6200 | 795 | 852 | 911 | 964 | 1019 | 1184 | 1476 | | | |
| 6300 | 807 | 866 | 926 | 980 | 1035 | 1204 | 1500 | | | |
| 6400 | 821 | 880 | 941 | 995 | 1052 | 1223 | 1524 | | | |

TAPE DRIVE TWISTER

SPEED TABLE

Giving Revolutions per Minute of 7" Cylinder Required to Produce Various Spindle Speeds

| R. P. M. OF SPINDLES | Revolutions per Minute of 7" Cylinder with | | | | | | | | |
|-------------------------|--|--|----------------------------|---|---|---|--|---|----------------------------|
| | $\frac{7}{8}$ inch Whirl Ratio 7.8 | $1\frac{1}{16}$ inch Whirl Ratio 7.27 | 1 inch Whirl Ratio 6.81 | $1\frac{1}{8}$ inch Whirl Ratio 6.43 | $1\frac{1}{4}$ inch Whirl Ratio 6.09 | $1\frac{3}{8}$ inch Whirl Ratio 5.22 | $1\frac{1}{2}$ inch Whirl Ratio 4.2 | $1\frac{3}{4}$ inch Whirl Ratio 3.93 | 2 inch Whirl Ratio 3.51 |
| 6500 | 833 | 893 | 955 | 1011 | 1069 | 1243 | | | |
| 6600 | 846 | 906 | 970 | 1024 | 1085 | 1262 | | | |
| 6700 | 859 | 921 | 985 | 1041 | 1100 | 1282 | | | |
| 6800 | 872 | 934 | 1000 | 1055 | 1117 | 1301 | | | |
| 6900 | 885 | 947 | 1014 | 1072 | 1134 | 1321 | | | |
| 7000 | 897 | 962 | 1029 | 1085 | 1150 | | | | |
| 7100 | 910 | 975 | 1044 | 1103 | 1167 | | | | |
| 7200 | 922 | 990 | 1058 | 1116 | 1184 | | | | |
| 7300 | 935 | 1002 | 1073 | 1133 | 1200 | | | | |
| 7400 | 948 | 1016 | 1088 | 1150 | 1216 | | | | |
| 7500 | 961 | 1031 | 1103 | 1164 | 1233 | | | | |
| 7600 | 974 | 1044 | 1117 | 1181 | 1249 | | | | |
| 7700 | 987 | 1057 | 1132 | 1195 | 1266 | | | | |
| 7800 | 1000 | 1072 | 1147 | 1212 | 1283 | | | | |
| 7900 | 1013 | 1085 | 1162 | 1226 | 1299 | | | | |
| 8000 | 1026 | 1100 | 1176 | 1242 | | | | | |
| 8100 | 1038 | 1113 | 1191 | 1256 | | | | | |
| 8200 | 1051 | 1126 | 1206 | 1273 | | | | | |
| 8300 | 1064 | 1141 | 1220 | 1290 | | | | | |
| 8400 | 1077 | 1154 | 1235 | 1304 | | | | | |
| 8500 | 1090 | 1167 | 1250 | | | | | | |
| 8600 | 1102 | 1182 | 1264 | | | | | | |
| 8700 | 1115 | 1195 | 1279 | | | | | | |
| 8800 | 1128 | 1210 | 1294 | | | | | | |
| 8900 | 1141 | 1223 | 1309 | | | | | | |
| 9000 | 1154 | 1236 | | | | | | | |
| 9100 | 1167 | 1251 | | | | | | | |
| 9200 | 1179 | 1264 | | | | | | | |
| 9300 | 1192 | 1276 | | | | | | | |
| 9400 | 1205 | 1292 | | | | | | | |
| 9500 | 1218 | | | | | | | | |
| 9600 | 1231 | | | | | | | | |
| 9700 | 1243 | | | | | | | | |
| 9800 | 1256 | | | | | | | | |
| 9900 | 1269 | | | | | | | | |
| 10000 | 1282 | | | | | | | | |

TAPE DRIVE TWISTER

SPEED TABLE

Giving Revolutions per Minute of 8" Cylinder Required to Produce Various Spindle Speeds

| R. P. M. OF SPINDLES | Revolutions per Minute of 8" Cylinder with | | | | | | | | | |
|-------------------------|--|---|---------------------------|---|--|--|--|--|---------------------------|--|
| | $\frac{3}{8}$ inch Whirl Ratio 8.8 | $\frac{15}{16}$ inch Whirl Ratio 8.3 | 1 inch Whirl Ratio 7.8 | $1\frac{1}{16}$ inch Whirl Ratio 7.3 | $1\frac{1}{8}$ inch Whirl Ratio 7.0 | $1\frac{1}{4}$ inch Whirl Ratio 6.9 | $1\frac{3}{8}$ inch Whirl Ratio 6.4 | $1\frac{1}{2}$ inch Whirl Ratio 6.0 | 2 inch Whirl Ratio 5.0 | $2\frac{1}{2}$ inch Whirl Ratio 4.0 |
| 3000 | ... | ... | ... | ... | ... | 509 | 620 | 664 | 750 | 938 |
| 3100 | ... | ... | ... | ... | ... | 526 | 641 | 686 | 775 | 969 |
| 3200 | ... | ... | ... | ... | ... | 543 | 662 | 708 | 800 | 1000 |
| 3300 | ... | ... | ... | ... | ... | 559 | 682 | 730 | 825 | 1031 |
| 3400 | ... | ... | ... | ... | ... | 576 | 702 | 752 | 850 | 1062 |
| 3500 | ... | ... | ... | ... | 500 | 593 | 723 | 774 | 875 | 1093 |
| 3600 | ... | ... | ... | ... | 514 | 610 | 744 | 796 | 900 | 1125 |
| 3700 | ... | ... | ... | ... | 529 | 627 | 764 | 818 | 925 | 1156 |
| 3800 | ... | ... | ... | ... | 543 | 644 | 785 | 841 | 950 | 1187 |
| 3900 | ... | ... | ... | ... | 557 | 661 | 806 | 864 | 975 | 1219 |
| 4000 | ... | ... | ... | 548 | 571 | 678 | 827 | 885 | 1000 | 1250 |
| 4100 | ... | ... | ... | 561 | 586 | 695 | 847 | 907 | 1025 | 1282 |
| 4200 | ... | ... | ... | 575 | 600 | 711 | 868 | 929 | 1050 | 1313 |
| 4300 | ... | ... | ... | 589 | 614 | 728 | 889 | 951 | 1075 | 1344 |
| 4400 | ... | ... | ... | 603 | 628 | 745 | 909 | 973 | 1100 | 1375 |
| 4500 | ... | ... | 577 | 616 | 643 | 762 | 930 | 995 | 1125 | |
| 4600 | ... | ... | 590 | 630 | 657 | 779 | 951 | 1018 | 1150 | |
| 4700 | ... | ... | 602 | 644 | 671 | 796 | 972 | 1040 | 1175 | |
| 4800 | ... | ... | 615 | 657 | 686 | 812 | 993 | 1062 | 1200 | |
| 4900 | ... | ... | 628 | 671 | 700 | 830 | 1013 | 1085 | 1225 | |
| 5000 | ... | 602 | 641 | 685 | 714 | 847 | 1033 | 1107 | 1250 | |
| 5100 | ... | 614 | 654 | 698 | 728 | 864 | 1054 | 1129 | 1275 | |
| 5200 | ... | 627 | 667 | 712 | 742 | 881 | 1074 | 1151 | 1300 | |
| 5300 | ... | 639 | 680 | 726 | 757 | 898 | 1095 | 1173 | 1325 | |
| 5400 | ... | 651 | 692 | 740 | 771 | 915 | 1116 | 1196 | 1350 | |
| 5500 | 625 | 662 | 704 | 753 | 785 | 932 | 1136 | 1217 | | |
| 5600 | 636 | 674 | 718 | 767 | 800 | 949 | 1157 | 1239 | | |
| 5700 | 648 | 687 | 730 | 781 | 814 | 966 | 1177 | 1262 | | |
| 5800 | 659 | 698 | 743 | 794 | 828 | 983 | 1198 | 1284 | | |
| 5900 | 670 | 710 | 756 | 806 | 842 | 1000 | 1219 | 1306 | | |
| 6000 | 682 | 723 | 769 | 821 | 857 | 1017 | 1240 | | | |
| 6100 | 693 | 734 | 782 | 836 | 871 | 1034 | 1260 | | | |
| 6200 | 704 | 746 | 794 | 849 | 885 | 1050 | 1281 | | | |
| 6300 | 716 | 759 | 808 | 863 | 900 | 1067 | 1301 | | | |
| 6400 | 728 | 770 | 820 | 876 | 914 | 1084 | 1322 | | | |

TAPE DRIVE TWISTER SPEED TABLE

**Giving Revolutions per Minute of 8" Cylinder Required to Produce Various
Spindle Speeds**

| R. P. M OF SPINDLES | Revolutions per Minute of 8" Cylinder with | | | | | | | | | |
|------------------------|--|---------------------------------------|---------------------------|--|--|--|---|---|----------------------------|--|
| | $\frac{3}{8}$ inch Whirl Ratio 8.8 | $\frac{1}{2}$ inch Whirl Ratio 8.3 | 1 inch Whirl Ratio 7.8 | $1\frac{1}{8}$ inch Whirl Ratio 7.3 | $1\frac{1}{4}$ inch Whirl Ratio 7.0 | $1\frac{3}{8}$ inch Whirl Ratio 5.9 | $1\frac{1}{2}$ inch Whirl Ratio 4.84 | $1\frac{3}{4}$ inch Whirl Ratio 4.52 | 2 inch Whirl Ratio 4.00 | $2\frac{1}{2}$ inch Whirl Ratio 3.2 |
| 6500 | 739 | 783 | 833 | 890 | 928 | 1101 | | | | |
| 6600 | 750 | 795 | 846 | 903 | 943 | 1118 | | | | |
| 6700 | 761 | 807 | 859 | 918 | 957 | 1135 | | | | |
| 6800 | 773 | 819 | 872 | 931 | 971 | 1152 | | | | |
| 6900 | 784 | 831 | 885 | 945 | 986 | 1169 | | | | |
| 7000 | 795 | 843 | 897 | 959 | 1000 | 1186 | | | | |
| 7100 | 806 | 855 | 910 | 972 | 1014 | 1203 | | | | |
| 7200 | 817 | 867 | 922 | 986 | 1028 | 1220 | | | | |
| 7300 | 828 | 879 | 936 | 1000 | 1043 | 1237 | | | | |
| 7400 | 841 | 891 | 949 | 1013 | 1057 | 1254 | | | | |
| 7500 | 852 | 903 | 961 | 1025 | 1071 | 1271 | | | | |
| 7600 | 864 | 916 | 974 | 1040 | 1085 | 1288 | | | | |
| 7700 | 875 | 928 | 987 | 1054 | 1100 | 1305 | | | | |
| 7800 | 886 | 940 | 1000 | 1066 | 1114 | 1322 | | | | |
| 7900 | 898 | 952 | 1013 | 1082 | 1128 | 1339 | | | | |
| 8000 | 908 | 964 | 1026 | 1096 | 1142 | | | | | |
| 8100 | 920 | 976 | 1038 | 1110 | 1157 | | | | | |
| 8200 | 932 | 988 | 1051 | 1123 | 1171 | | | | | |
| 8300 | 943 | 1000 | 1064 | 1137 | 1185 | | | | | |
| 8400 | 954 | 1012 | 1076 | 1151 | 1200 | | | | | |
| 8500 | 966 | 1024 | 1089 | 1164 | 1214 | | | | | |
| 8600 | 977 | 1036 | 1102 | 1178 | 1228 | | | | | |
| 8700 | 989 | 1048 | 1115 | 1192 | 1243 | | | | | |
| 8800 | 1000 | 1060 | 1128 | 1204 | 1257 | | | | | |
| 8900 | 1010 | 1072 | 1141 | 1219 | 1271 | | | | | |
| 9000 | 1022 | 1084 | 1154 | 1233 | | | | | | |
| 9100 | 1034 | 1096 | 1167 | 1247 | | | | | | |
| 9200 | 1045 | 1108 | 1179 | 1260 | | | | | | |
| 9300 | 1057 | 1120 | 1192 | 1274 | | | | | | |
| 9400 | 1068 | 1132 | 1205 | 1288 | | | | | | |
| 9500 | 1079 | 1144 | 1218 | 1302 | | | | | | |
| 9600 | 1091 | 1156 | 1231 | 1316 | | | | | | |
| 9700 | 1102 | 1169 | 1243 | 1329 | | | | | | |
| 9800 | 1114 | 1181 | 1256 | 1342 | | | | | | |
| 9900 | 1125 | 1193 | 1269 | 1356 | | | | | | |
| 10000 | 1136 | 1204 | 1282 | 1370 | | | | | | |

RULES FOR TWISTERS

To calculate the resulting counts of ply yarn, made of two strands of different sizes:

Divide the product of the single counts by their sum.

Example.— $40\text{s} \times 10\text{s} = 400 \div (40 + 10) = 8\text{s}$.

To calculate the single count that must be combined with another single strand of known size, in order to make a two-ply of given size:

Divide the product of the known counts by their difference.

Example.— $10\text{s} \times 8\text{s} = 80$. $80 \div (10 - 8) = 40\text{s}$.

To find the twist per inch of ply yarn:

Divide the number of yarn to be twisted by the ply required. Multiply the square root of this quotient by 4, 5 or 6, according to whether soft, medium or hard twist is required.

Example.—What is the medium twist per inch of 12s 3-ply?

$$12 \div 3 = 4. \sqrt{4} = 2. \quad 2 \times 5 = 10 \text{ turns per inch.}$$

To find the twist per inch in machine:

The product of the front roll gear, the stud gear, and the ratio of the spindle to the cylinder, divided by the product of the cylinder gear, and the circumference in inches of the front roll, equals the twist constant. Twist constant divided by change gear equals twist per inch.

Example.—What is the twist constant with the following gearing? Front roll gear 112 teeth, stud gear 88 teeth, $1\frac{5}{16}$ -inch whirl, 7-inch cylinder, ratio whirl to cylinder 4.80, front roll $1\frac{1}{2}$ -inch diameter, cylinder gear 22 teeth.

$$\frac{112 \times 88 \times 2 \times 4.80}{22 \times 3 \times 3.1416} = 456.3 \text{ constant.}$$

Twist Tables for Twisting Yarns.

Two Ply.

| No. of Yarn to be Twisted. | No. of Twisted Yarn. | Sq. root of No. Twisted Yarn. | Square root multiplied by | | | No. of Yarn to be Twisted. | No. of Twisted Yarn. | Sq. root of No. Twisted Yarn. | Square root multiplied by | | |
|----------------------------|----------------------|-------------------------------|---------------------------|-------|-------|----------------------------|----------------------|-------------------------------|---------------------------|-------|-------|
| | | | 4 | 5 | 6 | | | | 4 | 5 | 6 |
| 1 | .5 | .7071 | 2.83 | 3.54 | 4.24 | 51 | 25.5 | 5.0498 | 20.20 | 25.25 | 30.30 |
| 2 | 1. | 1. | 4. | 5. | 6. | 52 | 26. | 5.0990 | 20.40 | 25.50 | 30.59 |
| 3 | 1.5 | 1.2247 | 4.90 | 6.12 | 7.35 | 53 | 26.5 | 5.1478 | 20.59 | 25.74 | 30.89 |
| 4 | 2. | 1.4142 | 5.66 | 7.07 | 8.49 | 54 | 27. | 5.1962 | 20.78 | 25.98 | 31.18 |
| 5 | 2.5 | 1.5811 | 6.32 | 7.91 | 9.49 | 55 | 27.5 | 5.2440 | 20.98 | 26.22 | 31.46 |
| 6 | 3. | 1.7321 | 6.93 | 8.66 | 10.39 | 56 | 28. | 5.2915 | 21.17 | 26.46 | 31.75 |
| 7 | 3.5 | 1.8708 | 7.48 | 9.35 | 11.22 | 57 | 28.5 | 5.3385 | 21.35 | 26.69 | 32.03 |
| 8 | 4. | 2. | 8. | 10. | 12. | 58 | 29. | 5.3852 | 21.54 | 26.93 | 32.31 |
| 9 | 4.5 | 2.1213 | 8.49 | 10.61 | 12.73 | 59 | 29.5 | 5.4314 | 21.73 | 27.16 | 32.59 |
| 10 | 5. | 2.2361 | 8.94 | 11.18 | 13.42 | 60 | 30. | 5.4772 | 21.91 | 27.39 | 32.86 |
| 11 | 5.5 | 2.3452 | 9.38 | 11.73 | 14.07 | 61 | 30.5 | 5.5227 | 22.09 | 27.61 | 33.14 |
| 12 | 6. | 2.4495 | 9.80 | 12.25 | 14.70 | 62 | 31. | 5.5678 | 22.27 | 27.84 | 33.41 |
| 13 | 6.5 | 2.5495 | 10.20 | 12.75 | 15.30 | 63 | 31.5 | 5.6125 | 22.45 | 28.06 | 33.67 |
| 14 | 7. | 2.6458 | 10.58 | 13.23 | 15.87 | 64 | 32. | 5.6569 | 22.63 | 28.28 | 33.94 |
| 15 | 7.5 | 2.7386 | 10.95 | 13.69 | 16.43 | 65 | 32.5 | 5.7009 | 22.80 | 28.50 | 34.21 |
| 16 | 8. | 2.8284 | 11.31 | 14.14 | 16.97 | 66 | 33. | 5.7446 | 22.98 | 28.72 | 34.47 |
| 17 | 8.5 | 2.9155 | 11.66 | 14.58 | 17.49 | 67 | 33.5 | 5.7879 | 23.15 | 28.94 | 34.73 |
| 18 | 9. | 3. | 12. | 15. | 18. | 68 | 34. | 5.8310 | 23.32 | 29.15 | 34.99 |
| 19 | 9.5 | 3.0822 | 12.33 | 15.41 | 18.49 | 69 | 34.5 | 5.8737 | 23.49 | 29.37 | 35.24 |
| 20 | 10. | 3.1623 | 12.65 | 15.81 | 18.97 | 70 | 35. | 5.9161 | 23.66 | 29.58 | 35.50 |
| 21 | 10.5 | 3.2404 | 12.96 | 16.20 | 19.44 | 71 | 35.5 | 5.9582 | 23.83 | 29.79 | 35.75 |
| 22 | 11. | 3.3166 | 13.27 | 16.58 | 19.90 | 72 | 36. | 6. | 24. | 30. | 36. |
| 23 | 11.5 | 3.3912 | 13.56 | 16.96 | 20.35 | 73 | 36.5 | 6.0415 | 24.17 | 30.21 | 36.25 |
| 24 | 12. | 3.4641 | 13.86 | 17.32 | 20.78 | 74 | 37. | 6.0828 | 24.33 | 30.41 | 36.50 |
| 25 | 12.5 | 3.5355 | 14.14 | 17.68 | 21.21 | 75 | 37.5 | 6.1237 | 24.49 | 30.62 | 36.74 |
| 26 | 13. | 3.6056 | 14.42 | 18.03 | 21.63 | 76 | 38. | 6.1644 | | 30.82 | 36.99 |
| 27 | 13.5 | 3.6742 | 14.70 | 18.37 | 22.05 | 77 | 38.5 | 6.2049 | | 31.02 | 37.23 |
| 28 | 14. | 3.7417 | 14.97 | 18.71 | 22.45 | 78 | 39. | 6.2450 | | 31.22 | 37.47 |
| 29 | 14.5 | 3.8079 | 15.23 | 19.04 | 22.85 | 79 | 39.5 | 6.2849 | | 31.42 | 37.71 |
| 30 | 15. | 3.8730 | 15.49 | 19.37 | 23.24 | 80 | 40. | 6.3246 | | 31.62 | 37.95 |
| 31 | 15.5 | 3.9370 | 15.75 | 19.69 | 23.62 | 81 | 40.5 | 6.3640 | | 31.82 | 38.18 |
| 32 | 16. | 4. | 16. | 20. | 24. | 82 | 41. | 6.4031 | | 32.02 | 38.42 |
| 33 | 16.5 | 4.0620 | 16.25 | 20.31 | 24.37 | 83 | 41.5 | 6.4420 | | 32.21 | 38.65 |
| 34 | 17. | 4.1231 | 16.49 | 20.62 | 24.74 | 84 | 42. | 6.4807 | | 32.40 | 38.88 |
| 35 | 17.5 | 4.1833 | 16.73 | 20.92 | 25.10 | 85 | 42.5 | 6.5192 | | 32.60 | 39.12 |
| 36 | 18. | 4.2426 | 16.97 | 21.21 | 25.46 | 86 | 43. | 6.5574 | | 32.79 | 39.34 |
| 37 | 18.5 | 4.3012 | 17.20 | 21.51 | 25.81 | 87 | 43.5 | 6.5955 | | 32.98 | 39.57 |
| 38 | 19. | 4.3589 | 17.44 | 21.79 | 26.15 | 88 | 44. | 6.6332 | | 33.17 | 39.80 |
| 39 | 19.5 | 4.4159 | 17.66 | 22.08 | 26.50 | 89 | 44.5 | 6.6708 | | 33.35 | 40.02 |
| 40 | 20. | 4.4721 | 17.89 | 22.36 | 26.83 | 90 | 45. | 6.7082 | | 33.54 | 40.25 |
| 41 | 20.5 | 4.5277 | 18.11 | 22.64 | 27.17 | 91 | 45.5 | 6.7454 | | 33.73 | 40.47 |
| 42 | 21. | 4.5826 | 18.33 | 22.91 | 27.50 | 92 | 46. | 6.7823 | | 33.91 | 40.69 |
| 43 | 21.5 | 4.6368 | 18.55 | 23.18 | 27.82 | 93 | 46.5 | 6.8191 | | 34.10 | 40.91 |
| 44 | 22. | 4.6904 | 18.76 | 23.45 | 28.14 | 94 | 47. | 6.8557 | | 34.28 | 41.13 |
| 45 | 22.5 | 4.7434 | 18.97 | 23.72 | 28.46 | 95 | 47.5 | 6.8920 | | 34.46 | 41.35 |
| 46 | 23. | 4.7958 | 19.18 | 23.98 | 28.77 | 96 | 48. | 6.9282 | | 34.64 | 41.57 |
| 47 | 23.5 | 4.8477 | 19.39 | 24.24 | 29.09 | 97 | 48.5 | 6.9642 | | 34.82 | 41.79 |
| 48 | 24. | 4.8990 | 19.60 | 24.49 | 29.39 | 98 | 49. | 7. | | 35. | 42. |
| 49 | 24.5 | 4.9497 | 19.80 | 24.75 | 29.70 | 99 | 49.5 | 7.0356 | | 35.18 | 42.21 |
| 50 | 25. | 5. | 20. | 25. | 30. | 100 | 50. | 7.0711 | | 35.36 | 42.43 |

Twist Tables for Twisting Yarns.

Three Ply.

| No. of Yarn to be Twisted. | No. of Twisted Yarn. | Sq. root of No. Twisted Yarn. | Square root multiplied by | | | No. of Yarn to be Twisted. | No. of Twisted Yarn. | Sq. root of No. Twisted Yarn. | Square root multiplied by | | |
|----------------------------|----------------------|-------------------------------|---------------------------|-------|-------|----------------------------|----------------------|-------------------------------|---------------------------|-------|-------|
| | | | 4 | 5 | 6 | | | | 4 | 5 | 6 |
| 1 | .333 | .5774 | 2.31 | 2.89 | 3.46 | 51 | 17. | 4.1231 | 16.49 | 20.62 | 24.74 |
| 2 | .67 | .8165 | 3.27 | 4.08 | 4.90 | 52 | 17.33 | 4.1633 | 16.65 | 20.82 | 24.98 |
| 3 | 1. | 1. | 4. | 5. | 6. | 53 | 17.67 | 4.2032 | 16.81 | 21.02 | 25.22 |
| 4 | 1.33 | 1.1547 | 4.62 | 5.77 | 6.93 | 54 | 18. | 4.2426 | 16.97 | 21.21 | 25.46 |
| 5 | 1.67 | 1.2910 | 5.16 | 6.45 | 7.75 | 55 | 18.33 | 4.2817 | 17.13 | 21.41 | 25.69 |
| 6 | 2. | 1.4142 | 5.66 | 7.07 | 8.49 | 56 | 18.67 | 4.3205 | 17.28 | 21.60 | 25.92 |
| 7 | 2.33 | 1.5275 | 6.11 | 7.64 | 9.17 | 57 | 19. | 4.3589 | 17.44 | 21.79 | 26.15 |
| 8 | 2.67 | 1.6330 | 6.53 | 8.16 | 9.80 | 58 | 19.33 | 4.3970 | 17.59 | 21.98 | 26.38 |
| 9 | 3. | 1.7321 | 6.93 | 8.66 | 10.39 | 59 | 19.67 | 4.4347 | 17.74 | 22.17 | 26.61 |
| 10 | 3.33 | 1.8257 | 7.30 | 9.13 | 10.95 | 60 | 20. | 4.4721 | 17.89 | 22.36 | 26.83 |
| 11 | 3.67 | 1.9149 | 7.66 | 9.57 | 11.49 | 61 | 20.33 | 4.5092 | 18.04 | 22.55 | 27.06 |
| 12 | 4. | 2. | 8. | 10. | 12. | 62 | 20.67 | 4.5461 | 18.18 | 22.73 | 27.28 |
| 13 | 4.33 | 2.0817 | 8.33 | 10.41 | 12.49 | 63 | 21. | 4.5826 | 18.33 | 22.91 | 27.50 |
| 14 | 4.67 | 2.1602 | 8.64 | 10.80 | 12.96 | 64 | 21.33 | 4.6188 | 18.48 | 23.09 | 27.71 |
| 15 | 5. | 2.2361 | 8.94 | 11.18 | 13.42 | 65 | 21.67 | 4.6547 | 18.62 | 23.27 | 27.93 |
| 16 | 5.33 | 2.3094 | 9.24 | 11.55 | 13.86 | 66 | 22. | 4.6904 | 18.76 | 23.45 | 28.14 |
| 17 | 5.67 | 2.3805 | 9.52 | 11.90 | 14.28 | 67 | 22.33 | 4.7258 | 18.90 | 23.63 | 28.35 |
| 18 | 6. | 2.4495 | 9.80 | 12.25 | 14.70 | 68 | 22.67 | 4.7610 | 19.04 | 23.80 | 28.57 |
| 19 | 6.33 | 2.5166 | 10.07 | 12.58 | 15.10 | 69 | 23. | 4.7958 | 19.18 | 23.98 | 28.77 |
| 20 | 6.67 | 2.5820 | 10.33 | 12.91 | 15.49 | 70 | 23.33 | 4.8305 | 19.32 | 24.15 | 28.98 |
| 21 | 7. | 2.6458 | 10.58 | 13.23 | 15.87 | 71 | 23.67 | 4.8648 | 19.46 | 24.32 | 29.19 |
| 22 | 7.33 | 2.7080 | 10.83 | 13.54 | 16.25 | 72 | 24. | 4.8990 | 19.60 | 24.49 | 29.39 |
| 23 | 7.67 | 2.7689 | 11.08 | 13.84 | 16.61 | 73 | 24.33 | 4.9329 | 19.73 | 24.66 | 29.60 |
| 24 | 8. | 2.8284 | 11.31 | 14.14 | 16.97 | 74 | 24.67 | 4.9666 | 19.87 | 24.83 | 29.80 |
| 25 | 8.33 | 2.8868 | 11.55 | 14.43 | 17.32 | 75 | 25. | 5. | 20. | 25. | 30. |
| 26 | 8.67 | 2.9439 | 11.76 | 14.72 | 17.66 | 76 | 25.33 | 5.0332 | | 25.17 | 30.20 |
| 27 | 9. | 3. | 12. | 15. | 18. | 77 | 25.67 | 5.0662 | | 25.33 | 30.40 |
| 28 | 9.33 | 3.0551 | 12.22 | 15.28 | 18.33 | 78 | 26. | 5.0990 | | 25.50 | 30.59 |
| 29 | 9.67 | 3.1091 | 12.44 | 15.55 | 18.65 | 79 | 26.33 | 5.1316 | | 25.66 | 30.79 |
| 30 | 10. | 3.1623 | 12.65 | 15.81 | 18.97 | 80 | 26.67 | 5.1640 | | 25.82 | 30.98 |
| 31 | 10.33 | 3.2145 | 12.86 | 16.07 | 19.29 | 81 | 27. | 5.1962 | | 25.98 | 31.18 |
| 32 | 10.67 | 3.2659 | 13.06 | 16.33 | 19.60 | 82 | 27.33 | 5.2281 | | 26.14 | 31.37 |
| 33 | 11. | 3.3166 | 13.27 | 16.58 | 19.90 | 83 | 27.67 | 5.2599 | | 26.30 | 31.56 |
| 34 | 11.33 | 3.3665 | 13.47 | 16.83 | 20.20 | 84 | 28. | 5.2915 | | 26.46 | 31.75 |
| 35 | 11.67 | 3.4157 | 13.66 | 17.08 | 20.49 | 85 | 28.33 | 5.3229 | | 26.61 | 31.94 |
| 36 | 12. | 3.4641 | 13.86 | 17.32 | 20.78 | 86 | 28.67 | 5.3541 | | 26.77 | 32.12 |
| 37 | 12.33 | 3.5119 | 14.05 | 17.56 | 21.07 | 87 | 29. | 5.3852 | | 26.93 | 32.31 |
| 38 | 12.67 | 3.5590 | 14.24 | 17.80 | 21.35 | 88 | 29.33 | 5.4160 | | 27.08 | 32.50 |
| 39 | 13. | 3.6056 | 14.42 | 18.03 | 21.63 | 89 | 29.67 | 5.4467 | | 27.23 | 32.68 |
| 40 | 13.33 | 3.6515 | 14.61 | 18.26 | 21.91 | 90 | 30. | 5.4772 | | 27.39 | 32.86 |
| 41 | 13.67 | 3.6969 | 14.79 | 18.48 | 22.18 | 91 | 30.33 | 5.5076 | | 27.54 | 33.05 |
| 42 | 14. | 3.7417 | 14.97 | 18.71 | 22.45 | 92 | 30.67 | 5.5377 | | 27.69 | 33.23 |
| 43 | 14.33 | 3.7859 | 15.14 | 18.93 | 22.72 | 93 | 31. | 5.5678 | | 27.84 | 33.41 |
| 44 | 14.67 | 3.8297 | 15.32 | 19.15 | 22.98 | 94 | 31.33 | 5.5976 | | 27.99 | 33.59 |
| 45 | 15. | 3.8730 | 15.49 | 19.36 | 23.24 | 95 | 31.67 | 5.6273 | | 28.14 | 33.76 |
| 46 | 15.33 | 3.9158 | 15.66 | 19.58 | 23.49 | 96 | 32. | 5.6569 | | 28.28 | 33.94 |
| 47 | 15.67 | 3.9582 | 15.83 | 19.79 | 23.75 | 97 | 32.33 | 5.6862 | | 28.43 | 34.12 |
| 48 | 16. | 4. | 16. | 20. | 24. | 98 | 32.67 | 5.7155 | | 28.58 | 34.29 |
| 49 | 16.33 | 4.0415 | 16.17 | 20.21 | 24.25 | 99 | 33. | 5.7446 | | 28.72 | 34.47 |
| 50 | 16.67 | 4.0825 | 16.33 | 20.41 | 24.49 | 100 | 33.33 | 5.7735 | | 28.87 | 34.64 |

Twist Tables for Twisting Yarns.

Four Ply.

| No. of Yarn to be Twisted. | No. of Twisted Yarn. | Sq. root of No. Twisted Yarn. | Square root multiplied by | | | No. of Yarn to be Twisted. | No. of Twisted Yarn. | Sq. root of No. Twisted Yarn. | Square root multiplied by | | |
|----------------------------|----------------------|-------------------------------|---------------------------|-------|-------|----------------------------|----------------------|-------------------------------|---------------------------|-------|-------|
| | | | 4 | 5 | 6 | | | | 4 | 5 | 6 |
| 1 | .25 | .5 | 2. | 2.5 | 3. | 51 | 12.75 | 3.5707 | 14.28 | 17.85 | 21.42 |
| 2 | .50 | .7071 | 2.83 | 3.54 | 4.24 | 52 | 13. | 3.6056 | 14.42 | 18.03 | 21.63 |
| 3 | .75 | .8660 | 3.46 | 4.33 | 5.20 | 53 | 13.25 | 3.6401 | 14.56 | 18.20 | 21.84 |
| 4 | 1. | 1. | 4. | 5. | 6. | 54 | 13.50 | 3.6742 | 14.70 | 18.37 | 22.05 |
| 5 | 1.25 | 1.1180 | 4.47 | 5.59 | 6.71 | 55 | 13.75 | 3.7081 | 14.83 | 18.54 | 22.25 |
| 6 | 1.50 | 1.2247 | 4.90 | 6.12 | 7.35 | 56 | 14. | 3.7417 | 14.97 | 18.71 | 22.45 |
| 7 | 1.75 | 1.3229 | 5.29 | 6.61 | 7.94 | 57 | 14.25 | 3.7749 | 15.10 | 18.87 | 22.65 |
| 8 | 2. | 1.4142 | 5.66 | 7.07 | 8.49 | 58 | 14.50 | 3.8079 | 15.23 | 19.04 | 22.85 |
| 9 | 2.25 | 1.5 | 6. | 7.5 | 9. | 59 | 14.75 | 3.8406 | 15.36 | 19.20 | 23.04 |
| 10 | 2.50 | 1.5811 | 6.32 | 7.91 | 9.49 | 60 | 15. | 3.8730 | 15.49 | 19.37 | 23.24 |
| 11 | 2.75 | 1.6583 | 6.63 | 8.29 | 9.95 | 61 | 15.25 | 3.9051 | 15.62 | 19.53 | 23.43 |
| 12 | 3. | 1.7321 | 6.93 | 8.66 | 10.39 | 62 | 15.50 | 3.9370 | 15.75 | 19.69 | 23.62 |
| 13 | 3.25 | 1.8028 | 7.21 | 9.01 | 10.82 | 63 | 15.75 | 3.9686 | 15.88 | 19.84 | 23.81 |
| 14 | 3.50 | 1.8708 | 7.48 | 9.35 | 11.22 | 64 | 16. | 4. | 16. | 20. | 24. |
| 15 | 3.75 | 1.9365 | 7.75 | 9.68 | 11.62 | 65 | 16.25 | 4.0311 | 16.12 | 20.16 | 24.19 |
| 16 | 4. | 2. | 8. | 10. | 12. | 66 | 16.50 | 4.0620 | 16.25 | 20.31 | 24.37 |
| 17 | 4.25 | 2.0616 | 8.25 | 10.31 | 12.37 | 67 | 16.75 | 4.0927 | 16.37 | 20.46 | 24.56 |
| 18 | 4.50 | 2.1213 | 8.49 | 10.61 | 12.73 | 68 | 17. | 4.1231 | 16.49 | 20.62 | 24.74 |
| 19 | 4.75 | 2.1794 | 8.72 | 10.90 | 13.08 | 69 | 17.25 | 4.1533 | 16.61 | 20.77 | 24.92 |
| 20 | 5. | 2.2361 | 8.94 | 11.18 | 13.42 | 70 | 17.50 | 4.1833 | 16.73 | 20.92 | 25.10 |
| 21 | 5.25 | 2.2913 | 9.17 | 11.46 | 13.75 | 71 | 17.75 | 4.2130 | 16.85 | 21.07 | 25.28 |
| 22 | 5.50 | 2.3452 | 9.38 | 11.73 | 14.07 | 72 | 18. | 4.2426 | 16.97 | 21.21 | 25.46 |
| 23 | 5.75 | 2.3979 | 9.59 | 11.99 | 14.39 | 73 | 18.25 | 4.2720 | 17.09 | 21.36 | 25.63 |
| 24 | 6. | 2.4495 | 9.80 | 12.25 | 14.70 | 74 | 18.50 | 4.3012 | 17.20 | 21.51 | 25.81 |
| 25 | 6.25 | 2.5 | 10. | 12.5 | 15. | 75 | 18.75 | 4.3301 | 17.32 | 21.65 | 25.98 |
| 26 | 6.50 | 2.5495 | 10.20 | 12.75 | 15.30 | 76 | 19. | 4.3589 | 21.79 | 26.15 | |
| 27 | 6.75 | 2.5981 | 10.39 | 12.99 | 15.59 | 77 | 19.25 | 4.3875 | 21.94 | 26.32 | |
| 28 | 7. | 2.6458 | 10.58 | 13.23 | 15.87 | 78 | 19.50 | 4.4159 | 22.08 | 26.50 | |
| 29 | 7.25 | 2.6926 | 10.77 | 13.46 | 16.16 | 79 | 19.75 | 4.4441 | 22.22 | 26.66 | |
| 30 | 7.50 | 2.7386 | 10.95 | 13.69 | 16.43 | 80 | 20. | 4.4721 | 22.36 | 26.83 | |
| 31 | 7.75 | 2.7839 | 11.14 | 13.92 | 16.70 | 81 | 20.25 | 4.5 | 22.5 | 27. | |
| 32 | 8. | 2.8284 | 11.31 | 14.14 | 16.97 | 82 | 20.50 | 4.5277 | 22.64 | 27.17 | |
| 33 | 8.25 | 2.8723 | 11.49 | 14.36 | 17.23 | 83 | 20.75 | 4.5552 | 22.78 | 27.33 | |
| 34 | 8.50 | 2.9155 | 11.66 | 14.58 | 17.49 | 84 | 21. | 4.5826 | 22.91 | 27.50 | |
| 35 | 8.75 | 2.9580 | 11.83 | 14.79 | 17.75 | 85 | 21.25 | 4.6098 | 23.05 | 27.66 | |
| 36 | 9. | 3. | 12. | 15. | 18. | 86 | 21.50 | 4.6368 | 23.18 | 27.82 | |
| 37 | 9.25 | 3.0414 | 12.17 | 15.21 | 18.25 | 87 | 21.75 | 4.6637 | 23.32 | 27.98 | |
| 38 | 9.50 | 3.0822 | 12.33 | 15.41 | 18.49 | 88 | 22. | 4.6904 | 23.45 | 28.14 | |
| 39 | 9.75 | 3.1225 | 12.49 | 15.61 | 18.73 | 89 | 22.25 | 4.7170 | 23.58 | 28.30 | |
| 40 | 10. | 3.1623 | 12.65 | 15.81 | 18.97 | 90 | 22.50 | 4.7434 | 23.72 | 28.46 | |
| 41 | 10.25 | 3.2016 | 12.81 | 16.01 | 19.21 | 91 | 22.75 | 4.7697 | 23.85 | 28.62 | |
| 42 | 10.50 | 3.2404 | 12.96 | 16.20 | 19.44 | 92 | 23. | 4.7958 | 23.98 | 28.77 | |
| 43 | 10.75 | 3.2787 | 13.11 | 16.39 | 19.67 | 93 | 23.25 | 4.8218 | 24.11 | 28.93 | |
| 44 | 11. | 3.3166 | 13.27 | 16.58 | 19.90 | 94 | 23.50 | 4.8477 | 24.24 | 29.09 | |
| 45 | 11.25 | 3.3541 | 13.42 | 16.77 | 20.12 | 95 | 23.75 | 4.8734 | 24.37 | 29.24 | |
| 46 | 11.50 | 3.3912 | 13.56 | 16.96 | 20.35 | 96 | 24. | 4.8990 | 24.49 | 29.39 | |
| 47 | 11.75 | 3.4278 | 13.71 | 17.14 | 20.57 | 97 | 24.25 | 4.9244 | 24.62 | 29.55 | |
| 48 | 12. | 3.4641 | 13.86 | 17.32 | 20.78 | 98 | 24.50 | 4.9497 | 24.75 | 29.70 | |
| 49 | 12.25 | 3.5 | 14. | 17.5 | 21. | 99 | 24.75 | 4.9749 | 24.87 | 29.85 | |
| 50 | 12.50 | 3.5355 | 14.14 | 17.68 | 21.21 | 100 | 25. | 5. | 25. | 30. | |

Twist Tables for Twisting Yarns

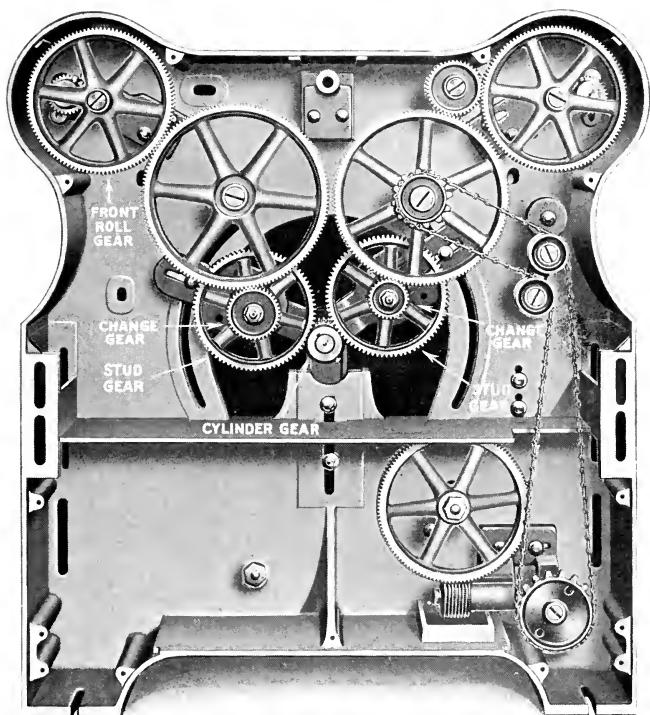
Five Ply.

| No. of Yarn to be Twisted. | No. of Twisted Yarn. | Sq. root of No. Twisted Yarn. | Square root multiplied by | | | No. of Yarn to be Twisted. | No. of Twisted Yarn. | Sq. root of No. Twisted Yarn. | Square root multiplied by | | |
|----------------------------|----------------------|-------------------------------|---------------------------|-------|-------|----------------------------|----------------------|-------------------------------|---------------------------|-------|-------|
| | | | 4 | 5 | 6 | | | | 4 | 5 | 6 |
| 1 | 2 | .4472 | 1.79 | 2.24 | 2.68 | 51 | 10.2 | 3.1937 | 12.77 | 15.97 | 19.16 |
| 2 | 4 | .6325 | 2.53 | 3.16 | 3.79 | 52 | 10.4 | 3.2249 | 12.90 | 16.12 | 19.35 |
| 3 | 6 | .7746 | 3.10 | 3.87 | 4.65 | 53 | 10.6 | 3.2558 | 13.02 | 16.28 | 19.53 |
| 4 | 8 | .8944 | 3.58 | 4.47 | 5.37 | 54 | 10.8 | 3.2863 | 13.15 | 16.43 | 19.72 |
| 5 | 1. | 1. | 4. | 5. | 6. | 55 | 11. | 3.3166 | 13.27 | 16.58 | 19.90 |
| 6 | 1.2 | 1.0954 | 4.38 | 5.48 | 6.57 | 56 | 11.2 | 3.3466 | 13.39 | 16.73 | 20.08 |
| 7 | 1.4 | 1.1832 | 4.73 | 5.92 | 7.10 | 57 | 11.4 | 3.3764 | 13.51 | 16.88 | 20.26 |
| 8 | 1.6 | 1.2649 | 5.06 | 6.32 | 7.59 | 58 | 11.6 | 3.4059 | 13.62 | 17.03 | 20.44 |
| 9 | 1.8 | 1.3416 | 5.37 | 6.71 | 8.05 | 59 | 11.8 | 3.4351 | 13.74 | 17.18 | 20.61 |
| 10 | 2. | 1.4142 | 5.66 | 7.07 | 8.49 | 60 | 12. | 3.4641 | 13.86 | 17.32 | 20.78 |
| 11 | 2.2 | 1.4832 | 5.93 | 7.42 | 8.90 | 61 | 12.2 | 3.4928 | 13.97 | 17.46 | 20.96 |
| 12 | 2.4 | 1.5492 | 6.20 | 7.75 | 9.30 | 62 | 12.4 | 3.5214 | 14.09 | 17.61 | 21.13 |
| 13 | 2.6 | 1.6125 | 6.45 | 8.06 | 9.67 | 63 | 12.6 | 3.5496 | 14.20 | 17.75 | 21.30 |
| 14 | 2.8 | 1.6733 | 6.69 | 8.37 | 10.04 | 64 | 12.8 | 3.5777 | 14.31 | 17.89 | 21.47 |
| 15 | 3. | 1.7321 | 6.93 | 8.66 | 10.39 | 65 | 13. | 3.6056 | 14.42 | 18.03 | 21.63 |
| 16 | 3.2 | 1.7889 | 7.16 | 8.95 | 10.73 | 66 | 13.2 | 3.6332 | 14.53 | 18.17 | 21.80 |
| 17 | 3.4 | 1.8439 | 7.38 | 9.22 | 11.06 | 67 | 13.4 | 3.6606 | 14.64 | 18.30 | 21.96 |
| 18 | 3.6 | 1.8974 | 7.59 | 9.49 | 11.38 | 68 | 13.6 | 3.6878 | 14.75 | 18.44 | 22.13 |
| 19 | 3.8 | 1.9494 | 7.80 | 9.75 | 11.70 | 69 | 13.8 | 3.7148 | 14.86 | 18.56 | 22.29 |
| 20 | 4. | 2. | 8. | 10. | 12. | 70 | 14. | 3.7417 | 14.97 | 18.71 | 22.45 |
| 21 | 4.2 | 2.0494 | 8.20 | 10.25 | 12.30 | 71 | 14.2 | 3.6783 | 15.07 | 18.84 | 22.61 |
| 22 | 4.4 | 2.0976 | 8.39 | 10.49 | 12.59 | 72 | 14.4 | 3.7948 | 15.18 | 18.97 | 22.77 |
| 23 | 4.6 | 2.1448 | 8.58 | 10.72 | 12.87 | 73 | 14.6 | 3.8210 | 15.28 | 19.10 | 22.93 |
| 24 | 4.8 | 2.1909 | 8.76 | 10.95 | 13.15 | 74 | 14.8 | 3.8471 | 15.38 | 19.24 | 23.08 |
| 25 | 5. | 2.2361 | 8.94 | 11.18 | 13.42 | 75 | 15. | 3.8730 | 15.49 | 19.37 | 23.24 |
| 26 | 5.2 | 2.2804 | 9.12 | 11.40 | 13.68 | 76 | 15.2 | 3.8987 | | 19.49 | 23.39 |
| 27 | 5.4 | 2.3238 | 9.30 | 11.62 | 13.94 | 77 | 15.4 | 3.9243 | | 19.62 | 23.55 |
| 28 | 5.6 | 2.3664 | 9.47 | 11.83 | 14.20 | 78 | 15.6 | 3.9497 | | 19.75 | 23.70 |
| 29 | 5.8 | 2.4083 | 9.63 | 12.04 | 14.45 | 79 | 15.8 | 3.9749 | | 19.87 | 23.85 |
| 30 | 6. | 2.4495 | 9.80 | 12.25 | 14.70 | 80 | 16. | 4. | | 20. | 24. |
| 31 | 6.2 | 2.4900 | 9.96 | 12.45 | 14.94 | 81 | 16.2 | 4.0249 | | 20.12 | 24.15 |
| 32 | 6.4 | 2.5298 | 10.12 | 12.65 | 15.18 | 82 | 16.4 | 4.0497 | | 20.25 | 24.30 |
| 33 | 6.6 | 2.5690 | 10.28 | 12.85 | 15.41 | 83 | 16.6 | 4.0743 | | 20.37 | 24.45 |
| 34 | 6.8 | 2.6077 | 10.43 | 13.04 | 15.65 | 84 | 16.8 | 4.0988 | | 20.49 | 24.59 |
| 35 | 7. | 2.6458 | 10.58 | 13.23 | 15.87 | 85 | 17. | 4.1231 | | 20.62 | 24.74 |
| 36 | 7.2 | 2.6833 | 10.73 | 13.42 | 16.10 | 86 | 17.2 | 4.1473 | | 20.74 | 24.88 |
| 37 | 7.4 | 2.7203 | 10.88 | 13.60 | 16.32 | 87 | 17.4 | 4.1713 | | 20.86 | 25.03 |
| 38 | 7.6 | 2.7568 | 11.03 | 13.78 | 16.54 | 88 | 17.6 | 4.1952 | | 20.98 | 25.17 |
| 39 | 7.8 | 2.7928 | 11.17 | 13.96 | 16.76 | 89 | 17.8 | 4.2190 | | 21.10 | 25.31 |
| 40 | 8. | 2.8284 | 11.31 | 14.14 | 16.97 | 90 | 18. | 4.2426 | | 21.21 | 25.46 |
| 41 | 8.2 | 2.8636 | 11.45 | 14.32 | 17.18 | 91 | 18.2 | 4.2661 | | 21.33 | 25.60 |
| 42 | 8.4 | 2.8983 | 11.59 | 14.49 | 17.39 | 92 | 18.4 | 4.2895 | | 21.45 | 25.74 |
| 43 | 8.6 | 2.9326 | 11.73 | 14.66 | 17.60 | 93 | 18.6 | 4.3128 | | 21.56 | 25.88 |
| 44 | 8.8 | 2.9665 | 11.87 | 14.83 | 17.80 | 94 | 18.8 | 4.3359 | | 21.68 | 26.02 |
| 45 | 9. | 3. | 12. | 15. | 18. | 95 | 19. | 4.3589 | | 21.79 | 26.15 |
| 46 | 9.2 | 3.0332 | 12.13 | 15.17 | 18.20 | 96 | 19.2 | 4.3818 | | 21.91 | 26.29 |
| 47 | 9.4 | 3.0659 | 12.26 | 15.33 | 18.40 | 97 | 19.4 | 4.4045 | | 22.02 | 26.43 |
| 48 | 9.6 | 3.0984 | 12.39 | 15.49 | 18.59 | 98 | 19.6 | 4.4272 | | 22.14 | 26.50 |
| 49 | 9.8 | 3.1305 | 12.52 | 15.65 | 18.78 | 99 | 19.8 | 4.4497 | | 22.25 | 26.70 |
| 50 | 10. | 3.1623 | 12.65 | 15.81 | 18.97 | 100 | 20. | 4.4721 | | 22.36 | 26.83 |

Twist Tables for Twisting Yarns.

Six Ply.

| No. of Yarn to be Twisted. | No. of Twisted Yarn. | Sq. root of No. Twisted Yarn. | Square root multiplied by | | | No. of Yarn to be Twisted. | No. of Twisted Yarn. | Sq. root of No. Twisted Yarn. | Square root multiplied by | | |
|----------------------------|----------------------|-------------------------------|---------------------------|-------|-------|----------------------------|----------------------|-------------------------------|---------------------------|-------|-------|
| | | | 4 | 5 | 6 | | | | 4 | 5 | 6 |
| 1 | .17 | .4082 | 1.63 | 2.04 | 2.45 | 51 | 8.50 | 2.9155 | 11.66 | 14.58 | 17.49 |
| 2 | .33 | .5774 | 2.31 | 2.89 | 3.46 | 52 | 8.67 | 2.9439 | 11.78 | 14.72 | 17.66 |
| 3 | .50 | .7071 | 2.83 | 3.54 | 4.24 | 53 | 8.83 | 2.9721 | 11.89 | 14.86 | 17.83 |
| 4 | .67 | .8165 | 3.27 | 4.08 | 4.90 | 54 | 9.00 | 3.0000 | 12.00 | 15.00 | 18.00 |
| 5 | .83 | .9129 | 3.65 | 4.56 | 5.48 | 55 | 9.17 | 3.0277 | 12.11 | 15.14 | 18.17 |
| 6 | 1.00 | 1.0000 | 4.00 | 5.00 | 6.00 | 56 | 9.33 | 3.0551 | 12.22 | 15.28 | 18.33 |
| 7 | 1.17 | 1.0801 | 4.32 | 5.40 | 6.48 | 57 | 9.50 | 3.0822 | 12.33 | 15.41 | 18.49 |
| 8 | 1.33 | 1.1547 | 4.62 | 5.77 | 6.93 | 58 | 9.67 | 3.1091 | 12.44 | 15.55 | 18.65 |
| 9 | 1.50 | 1.2247 | 4.90 | 6.12 | 7.35 | 59 | 9.83 | 3.1358 | 12.54 | 15.68 | 18.81 |
| 10 | 1.67 | 1.2910 | 5.16 | 6.45 | 7.75 | 60 | 10.00 | 3.1623 | 12.65 | 15.81 | 18.97 |
| 11 | 1.83 | 1.3540 | 5.42 | 6.77 | 8.12 | 61 | 10.17 | 3.1885 | 12.75 | 15.94 | 19.13 |
| 12 | 2.00 | 1.4142 | 5.66 | 7.07 | 8.49 | 62 | 10.33 | 3.2145 | 12.86 | 16.07 | 19.29 |
| 13 | 2.17 | 1.4720 | 5.89 | 7.36 | 8.83 | 63 | 10.50 | 3.2404 | 12.96 | 16.20 | 19.44 |
| 14 | 2.33 | 1.5275 | 6.11 | 7.64 | 9.17 | 64 | 10.67 | 3.2659 | 13.06 | 16.33 | 19.60 |
| 15 | 2.50 | 1.5811 | 6.32 | 7.91 | 9.49 | 65 | 10.83 | 3.2914 | 13.17 | 16.46 | 19.75 |
| 16 | 2.67 | 1.6330 | 6.53 | 8.16 | 9.80 | 66 | 11.00 | 3.3166 | 13.27 | 16.58 | 19.90 |
| 17 | 2.83 | 1.6833 | 6.73 | 8.42 | 10.10 | 67 | 11.17 | 3.3417 | 13.37 | 16.71 | 20.05 |
| 18 | 3.00 | 1.7321 | 6.93 | 8.66 | 10.39 | 68 | 11.33 | 3.3665 | 13.47 | 16.83 | 20.20 |
| 19 | 3.17 | 1.7795 | 7.12 | 8.90 | 10.68 | 69 | 11.50 | 3.3912 | 13.56 | 16.96 | 20.35 |
| 20 | 3.33 | 1.8257 | 7.30 | 9.13 | 10.95 | 70 | 11.67 | 3.4157 | 13.66 | 17.08 | 20.49 |
| 21 | 3.50 | 1.8708 | 7.48 | 9.35 | 11.22 | 71 | 11.83 | 3.4400 | 13.76 | 17.20 | 20.64 |
| 22 | 3.67 | 1.9149 | 7.66 | 9.57 | 11.49 | 72 | 12.00 | 3.4641 | 13.86 | 17.32 | 20.78 |
| 23 | 3.83 | 1.9579 | 7.83 | 9.79 | 11.75 | 73 | 12.17 | 3.4881 | 13.95 | 17.44 | 20.93 |
| 24 | 4.00 | 2.0000 | 8.00 | 10.00 | 12.00 | 74 | 12.33 | 3.5119 | 14.05 | 17.56 | 21.07 |
| 25 | 4.17 | 2.0412 | 8.16 | 10.21 | 12.25 | 75 | 12.50 | 3.5355 | 14.14 | 17.68 | 21.21 |
| 26 | 4.33 | 2.0817 | 8.33 | 10.41 | 12.49 | 76 | 12.67 | 3.5590 | | 17.80 | 21.35 |
| 27 | 4.50 | 2.1213 | 8.49 | 10.61 | 12.73 | 77 | 12.83 | 3.5824 | | 17.91 | 21.49 |
| 28 | 4.67 | 2.1602 | 8.64 | 10.80 | 12.96 | 78 | 13.00 | 3.6056 | | 18.03 | 21.63 |
| 29 | 4.83 | 2.1985 | 8.79 | 10.99 | 13.19 | 79 | 13.17 | 3.6286 | | 18.14 | 21.77 |
| 30 | 5.00 | 2.2361 | 8.94 | 11.18 | 13.42 | 80 | 13.33 | 3.6515 | | 18.26 | 21.91 |
| 31 | 5.17 | 2.2730 | 9.09 | 11.37 | 13.64 | 81 | 13.50 | 3.6742 | | 18.37 | 22.05 |
| 32 | 5.33 | 2.3094 | 9.24 | 11.55 | 13.86 | 82 | 13.67 | 3.6969 | | 18.48 | 22.18 |
| 33 | 5.50 | 2.3452 | 9.38 | 11.73 | 14.07 | 83 | 13.83 | 3.7192 | | 18.60 | 22.32 |
| 34 | 5.67 | 2.3805 | 9.52 | 11.90 | 14.28 | 84 | 14.00 | 3.7417 | | 18.71 | 22.45 |
| 35 | 5.83 | 2.4152 | 9.66 | 12.08 | 14.49 | 85 | 14.17 | 3.7639 | | 18.82 | 22.58 |
| 36 | 6.00 | 2.4495 | 9.80 | 12.25 | 14.70 | 86 | 14.33 | 3.7859 | | 18.93 | 22.72 |
| 37 | 6.17 | 2.4833 | 9.93 | 12.42 | 14.90 | 87 | 14.50 | 3.8079 | | 19.04 | 22.85 |
| 38 | 6.33 | 2.5166 | 10.07 | 12.58 | 15.10 | 88 | 14.67 | 3.8297 | | 19.15 | 22.98 |
| 39 | 6.50 | 2.5495 | 10.20 | 12.75 | 15.30 | 89 | 14.83 | 3.8514 | | 19.26 | 23.11 |
| 40 | 6.67 | 2.5820 | 10.33 | 12.91 | 15.49 | 90 | 15.00 | 3.8730 | | 19.36 | 23.24 |
| 41 | 6.83 | 2.6141 | 10.46 | 13.07 | 15.68 | 91 | 15.17 | 3.8944 | | 19.47 | 23.37 |
| 42 | 7.00 | 2.6458 | 10.58 | 13.23 | 15.87 | 92 | 15.33 | 3.9158 | | 19.58 | 23.49 |
| 43 | 7.17 | 2.6771 | 10.71 | 13.39 | 16.06 | 93 | 15.50 | 3.9370 | | 19.69 | 23.62 |
| 44 | 7.33 | 2.7080 | 10.83 | 13.54 | 16.25 | 94 | 15.67 | 3.9582 | | 19.79 | 23.75 |
| 45 | 7.50 | 2.7386 | 10.95 | 13.69 | 16.43 | 95 | 15.83 | 3.9791 | | 19.90 | 23.87 |
| 46 | 7.67 | 2.7689 | 11.08 | 13.84 | 16.61 | 96 | 16.00 | 4.0000 | | 20.00 | 24.00 |
| 47 | 7.83 | 2.7988 | 11.20 | 13.99 | 16.79 | 97 | 16.17 | 4.0208 | | 20.10 | 24.12 |
| 48 | 8.00 | 2.8284 | 11.31 | 14.14 | 16.97 | 98 | 16.33 | 4.0415 | | 20.21 | 24.25 |
| 49 | 8.17 | 2.8577 | 11.43 | 14.29 | 17.15 | 99 | 16.50 | 4.0620 | | 20.31 | 24.37 |
| 50 | 8.33 | 2.8868 | 11.55 | 14.43 | 17.32 | 100 | 16.67 | 4.0825 | | 20.41 | 24.49 |



Band Drive Twisting Frame Twist Gearing.

Formula for figuring twist:

C = Cylinder Gear.

S = Stud Gear.

T = Change Gear.

F = Front Roll Gear.

R = Ratio Whirl to Cylinder.

D = Circumference of Front Roll.

$$\frac{F \times S \times R}{T \times C \times D} = \text{Twist per inch}$$

$$\frac{F \times S \times R}{C \times D} = \text{Twist Constant.}$$

$$\frac{\text{Twist Constant}}{\text{Change Gear}} = \text{Twist per inch.}$$

$$\frac{\text{Twist Constant}}{\text{Twist per inch.}} = \text{Twist Gear.}$$

BAND DRIVE

Twist Gearing Constants for Whitin Twisting Frame.

7 inch Cylinder.

| Front Roll 1½ in. Dia. | | Front Roll Gear 108 T | | | |
|------------------------|-------------------------|-----------------------|------------|-----------|-----------|
| Diameter of Whirl | Ratio Whirl to Cylinder | Cyl. 20 T | Stud 100 T | Cyl. 20 T | Stud 80 T |
| 7 in. | 7.25 | Const | Const | Const | Const |
| 1 11/16 " | 6.62 | 815.35 | 372.44 | 181.19 | 165.44 |
| 1 13/16 " | 6.24 | 744.50 | 340.08 | 165.44 | 155.95 |
| 1 15/16 " | 5.86 | 701.77 | 320.56 | 155.95 | 146.45 |
| 1 7/8 " | 5.43 | 659.03 | 301.04 | 146.45 | 135.70 |
| 1 11/8 " | 5.00 | 610.67 | 278.95 | 135.70 | 124.96 |
| 1 3/4 " | 4.80 | 539.82 | 246.58 | 119.96 | 114.03 |
| 1 1/2 " | 3.80 | 427.36 | 195.21 | 94.96 | 92.47 |
| 1 1/4 " | 3.41 | 416.11 | 190.68 | 92.47 | 85.22 |
| 1 1/8 " | 3.41 | 383.50 | 175.17 | 85.22 | 78.22 |
| 1 1/16 " | 2.66 | 279.15 | 136.65 | 66.48 | 66.48 |

8 inch Cylinder

| Front Roll 1½ in. Dia. | | Front Roll Gear 108 T. | | | |
|------------------------|-------------------------|------------------------|------------|-----------|-----------|
| Diameter of Whirl | Ratio Whirl to Cylinder | Cyl. 20 T | Stud 120 T | Cyl. 20 T | Stud 80 T |
| 8 in. | 8.25 | Const | Const | Const | Const |
| 1 1/2 " | 7.07 | 931.19 | 401.59 | 191.19 | 176.94 |
| 1 13/16 " | 6.80 | 862.59 | 376.23 | 176.94 | 161.55 |
| 1 11/8 " | 6.22 | 796.74 | 349.51 | 161.55 | 147.17 |
| 1 1/4 " | 5.48 | 689.51 | 301.04 | 147.17 | 130.13 |
| 1 1/8 " | 4.37 | 616.29 | 261.52 | 130.13 | 114.03 |
| 1 1/16 " | 4.12 | 496.85 | 224.40 | 114.03 | 92.47 |
| 1 1/32 " | 3.88 | 436.34 | 211.65 | 102.96 | 96.96 |
| 1 1/64 " | 3.43 | 436.34 | 199.32 | 96.96 | 92.47 |
| 1 1/128 " | 3.03 | 340.76 | 155.65 | 75.72 | 75.72 |

Front Roll 1½ in. Dia.

| Front Roll Gear 112 T. | |
|------------------------|---------|
| 7 in. | 1033.87 |
| 1 11/16 " | 861.56 |
| 1 13/16 " | 786.09 |
| 1 15/16 " | 707.73 |
| 1 7/8 " | 667.11 |
| 1 11/8 " | 606.37 |
| 1 13/8 " | 557.10 |
| 1 15/8 " | 516.22 |
| 1 7/4 " | 456.33 |
| 1 11/4 " | 361.85 |
| 1 13/4 " | 301.75 |
| 1 15/4 " | 251.18 |
| 1 7/2 " | 201.18 |
| 1 11/2 " | 151.18 |
| 1 13/2 " | 101.18 |
| 1 15/2 " | 51.18 |

Front Roll 1½ in. Dia.

| Front Roll Gear 112 T. | |
|------------------------|---------|
| 8 in. | 1180.75 |
| 1 1/2 " | 1003.76 |
| 1 13/16 " | 909.70 |
| 1 11/8 " | 826.90 |
| 1 13/8 " | 739.16 |
| 1 15/8 " | 651.22 |
| 1 7/4 " | 563.28 |
| 1 11/4 " | 475.34 |
| 1 13/4 " | 387.40 |
| 1 15/4 " | 299.46 |
| 1 7/2 " | 211.52 |
| 1 11/2 " | 123.58 |
| 1 13/2 " | 51.64 |

Rule to find Change Gear.— Divide Constant by Twist per inch Required.

BAND DRIVE

Twister Twist Gear Table.

FRONT ROLL $1\frac{1}{2}$ Inch Diameter.

Cylinder 7 inches Diameter. Ratio Cylinder to Whirl 1 to 7.25
 Whirl $\frac{7}{8}$ inch Diameter. Front Roll Gear 112 Teeth

| Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|-----------------|------------------------|-------------------------|-------------------------|-----------------|------------------------|-------------------------|-------------------------|
| | Twist | Twist | Twist | | Twist | Twist | Twist |
| 21T | | | 49.23 | 65T | 10.60 | 13.25 | 15.90 |
| 22 | | | 46.99 | 66 | 10.44 | 13.05 | 15.66 |
| 23 | | | 44.95 | 67 | 10.29 | 12.86 | 15.43 |
| 24 | | 35.90 | 43.07 | 68 | 10.14 | 12.67 | 15.20 |
| 25 | | 34.46 | 41.35 | 69 | 9.99 | 12.49 | 14.98 |
| 26 | | 33.44 | 39.76 | 70 | 9.85 | 12.31 | 14.77 |
| 27 | | 31.91 | 38.29 | 71 | 9.71 | 12.13 | 14.56 |
| 28 | | 30.77 | 36.92 | 72 | 9.57 | 11.97 | 14.36 |
| 29 | | 29.71 | 35.65 | 73 | 9.44 | 11.80 | |
| 30 | | 28.72 | 34.46 | 74 | 9.31 | 11.64 | |
| 31 | | 27.79 | 33.35 | 75 | 9.19 | 11.49 | |
| 32 | | 26.92 | 32.31 | 76 | 9.07 | 11.34 | |
| 33 | | 26.11 | 31.33 | 77 | 8.94 | 11.19 | |
| 34 | | 25.34 | 30.40 | 78 | 8.84 | 11.04 | |
| 35 | | 24.62 | 29.54 | 79 | 8.72 | 10.90 | |
| 36 | | 23.93 | 28.72 | 80 | 8.61 | 10.77 | |
| 37 | | 23.28 | 27.94 | 81 | 8.51 | 10.64 | |
| 38 | | 22.67 | 27.21 | 82 | 8.40 | 10.51 | |
| 39 | | 22.09 | 26.51 | 83 | 8.30 | 10.38 | |
| 40 | | 21.54 | 25.85 | 84 | 8.20 | 10.26 | |
| 41 | | 21.01 | 25.22 | 85 | 8.11 | 10.14 | |
| 42 | | 20.51 | 24.61 | 86 | 8.01 | 10.02 | |
| 43 | | 20.04 | 24.04 | 87 | 7.92 | 9.90 | |
| 44 | | 19.58 | 23.50 | 88 | 7.83 | 9.79 | |
| 45 | 15.31 | 19.14 | 22.97 | 89 | 7.74 | 9.68 | |
| 46 | 14.98 | 18.73 | 22.47 | 90 | 7.66 | 9.57 | |
| 47 | 14.66 | 18.33 | 22.00 | 91 | 7.57 | 9.47 | |
| 48 | 14.36 | 17.95 | 21.54 | 92 | 7.49 | 9.36 | |
| 49 | 14.07 | 17.58 | 21.10 | 93 | 7.41 | 9.26 | |
| 50 | 13.78 | 17.23 | 20.68 | 94 | | 9.16 | |
| 51 | 13.51 | 16.89 | 20.27 | 95 | | 9.07 | |
| 52 | 13.25 | 16.57 | 19.88 | 96 | | 8.97 | |
| 53 | 13.00 | 16.26 | 19.51 | | | | |
| 54 | 12.76 | 15.95 | 19.14 | | | | |
| 55 | 12.53 | 15.66 | 18.80 | | | | |
| 56 | 12.30 | 15.38 | 18.46 | | | | |
| 57 | 12.09 | 15.11 | 18.14 | | | | |
| 58 | 11.88 | 14.85 | 17.82 | | | | |
| 59 | 11.68 | 14.60 | 17.52 | | | | |
| 60 | 11.49 | 14.36 | 17.23 | | | | |
| 61 | 11.30 | 14.12 | 16.95 | | | | |
| 62 | 11.12 | 13.89 | 16.67 | | | | |
| 63 | 10.94 | 13.67 | 16.41 | | | | |
| 64 | 10.77 | 13.46 | 16.15 | | | | |
| Const's | 689.24 | 861.56 | 1033.87 | Const's | 689.24 | 861.56 | 1033.87 |

BAND DRIVE

Twister Twist Gear Table

FRONT ROLL $1\frac{1}{2}$ inch Diameter

Cylinder 7 inches diameter. Ratio Cylinder to Whirl 1 to 6.62

Whirl $\frac{15}{16}$ inch diameter. Front Roll Gear 112 teeth

| Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|-----------------|------------------------|-------------------------|-------------------------|-----------------|------------------------|-------------------------|-------------------------|
| | Twist | Twist | Twist | | Twist | Twist | Twist |
| 21T | | | 44.95 | 65T | 9.68 | 12.10 | 14.52 |
| 22 | | | 42.91 | 66 | 9.53 | 11.92 | 14.30 |
| 23 | | | 41.04 | 67 | 9.39 | 11.74 | 14.09 |
| 24 | | 32.78 | 39.33 | 68 | 9.25 | 11.57 | 13.88 |
| 25 | | 31.47 | 37.76 | 69 | 9.12 | 11.40 | 13.68 |
| 26 | | 30.26 | 36.31 | 70 | 8.99 | 11.24 | 13.49 |
| 27 | | 29.14 | 34.96 | 71 | 8.86 | 11.08 | 13.30 |
| 28 | | 28.10 | 33.71 | 72 | 8.74 | 10.93 | 13.11 |
| 29 | | 27.13 | 32.55 | 73 | 8.62 | 10.78 | |
| 30 | | 26.22 | 31.47 | 74 | 8.50 | 10.63 | |
| 31 | | 25.38 | 30.45 | 75 | 8.39 | 10.49 | |
| 32 | | 24.58 | 29.50 | 76 | 8.28 | 10.35 | |
| 33 | | 23.84 | 28.61 | 77 | 8.17 | 10.22 | |
| 34 | | 23.14 | 27.76 | 78 | 8.07 | 10.08 | |
| 35 | | 22.48 | 26.97 | 79 | 7.97 | 9.96 | |
| 36 | | 21.85 | 26.22 | 80 | 7.87 | 9.83 | |
| 37 | | 21.26 | 25.51 | 81 | 7.77 | 9.71 | |
| 38 | | 20.70 | 24.84 | 82 | 7.67 | 9.59 | |
| 39 | | 20.17 | 24.20 | 83 | 7.58 | 9.48 | |
| 40 | | 19.66 | 23.60 | 84 | 7.49 | 9.36 | |
| 41 | | 19.19 | 23.02 | 85 | 7.40 | 9.25 | |
| 42 | | 18.73 | 22.48 | 86 | 7.32 | 9.15 | |
| 43 | | 18.29 | 21.95 | 87 | 7.23 | 9.04 | |
| 44 | | 17.88 | 21.45 | 88 | 7.15 | 8.94 | |
| 45 | 13.98 | 17.48 | 20.98 | 89 | 7.07 | 8.84 | |
| 46 | 13.68 | 17.10 | 20.52 | 90 | 6.99 | 8.74 | |
| 47 | 13.39 | 16.74 | 20.08 | 91 | 6.91 | 8.64 | |
| 48 | 13.11 | 16.39 | 19.67 | 92 | 6.84 | 8.55 | |
| 49 | 12.84 | 16.05 | 19.26 | 93 | 6.76 | 8.46 | |
| 50 | 12.59 | 15.73 | 18.88 | 94 | | 8.37 | |
| 51 | 12.34 | 15.42 | 18.51 | 95 | | 8.28 | |
| 52 | 12.10 | 15.13 | 18.15 | 96 | | 8.19 | |
| 53 | 11.87 | 14.84 | 17.81 | | | | |
| 54 | 11.65 | 14.57 | 17.48 | | | | |
| 55 | 11.44 | 14.30 | 17.16 | | | | |
| 56 | 11.24 | 14.05 | 16.86 | | | | |
| 57 | 11.04 | 13.80 | 16.56 | | | | |
| 58 | 10.85 | 13.56 | 16.28 | | | | |
| 59 | 10.67 | 13.33 | 16.00 | | | | |
| 60 | 10.49 | 13.11 | 15.73 | | | | |
| 61 | 10.32 | 12.90 | 15.47 | | | | |
| 62 | 10.15 | 12.69 | 15.23 | | | | |
| 63 | 9.99 | 12.49 | 14.98 | | | | |
| 64 | 9.83 | 12.29 | 14.75 | | | | |
| Const's | 629.35 | 786.69 | 944.03 | Const's | 629.35 | 786.69 | 944.03 |

BAND DRIVE Twister Twist Gear Table.

FRONT ROLL $1\frac{1}{2}$ inch Diameter

Cylinder 7 inches Diameter. Ratio Cylinder to Whirl 1 to 6.24

Whirl 1 inch Diameter. Front Roll Gear 112 Teeth

| Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|-----------------|------------------------|-------------------------|-------------------------|-----------------|------------------------|-------------------------|-------------------------|
| | Twist | Twist | Twist | | Twist | Twist | Twist |
| 21T | | | 42.37 | 65T | 9.13 | 11.71 | 13.69 |
| 22 | | | 40.45 | 66 | 8.99 | 11.53 | 13.48 |
| 23 | | | 38.69 | 67 | 8.85 | 11.36 | 13.28 |
| 24 | | 31.70 | 37.07 | 68 | 8.72 | 11.19 | 13.08 |
| 25 | | 30.44 | 35.59 | 69 | 8.60 | 11.03 | 12.89 |
| 26 | | 29.26 | 34.23 | 70 | 8.47 | 10.87 | 12.71 |
| 27 | | 28.18 | 32.96 | 71 | 8.35 | 10.72 | 12.53 |
| 28 | | 27.17 | 31.78 | 72 | 8.24 | 10.57 | 12.36 |
| 29 | | 26.24 | 30.68 | 73 | 8.13 | 10.42 | |
| 30 | | 25.36 | 29.66 | 74 | 8.02 | 10.28 | |
| 31 | | 24.54 | 28.70 | 75 | 7.91 | 10.14 | |
| 32 | | 23.78 | 27.81 | 76 | 7.80 | 10.01 | |
| 33 | | 23.06 | 26.96 | 77 | 7.70 | 9.88 | |
| 34 | | 22.38 | 26.17 | 78 | 7.60 | 9.75 | |
| 35 | | 21.74 | 25.42 | 79 | 7.51 | 9.63 | |
| 36 | | 21.14 | 24.72 | 80 | 7.41 | 9.51 | |
| 37 | | 20.56 | 24.05 | 81 | 7.32 | 9.39 | |
| 38 | | 20.02 | 23.42 | 82 | 7.23 | 9.28 | |
| 39 | | 19.51 | 22.81 | 83 | 7.15 | 9.17 | |
| 40 | | 19.02 | 22.24 | 84 | 7.06 | 9.06 | |
| 41 | | 18.56 | 21.70 | 85 | 6.98 | 8.95 | |
| 42 | | 18.12 | 21.18 | 86 | 6.90 | 8.85 | |
| 43 | | 17.69 | 20.69 | 87 | 6.82 | 8.75 | |
| 44 | | 17.29 | 20.22 | 88 | 6.74 | 8.65 | |
| 45 | 13.18 | 16.91 | 19.77 | 89 | 6.66 | 8.55 | |
| 46 | 12.90 | 16.54 | 19.34 | 90 | 6.59 | 8.45 | |
| 47 | 12.62 | 16.19 | 18.93 | 91 | 6.52 | 8.36 | |
| 48 | 12.36 | 15.85 | 18.54 | 92 | 6.45 | 8.27 | |
| 49 | 12.11 | 15.53 | 18.16 | 93 | 6.38 | 8.18 | |
| 50 | 11.86 | 15.22 | 17.79 | 94 | | 8.09 | |
| 51 | 11.63 | 14.92 | 17.45 | 95 | | 8.01 | |
| 52 | 11.41 | 14.63 | 17.11 | 96 | | 7.93 | |
| 53 | 11.19 | 14.36 | 16.79 | | | | |
| 54 | 10.98 | 14.09 | 16.48 | | | | |
| 55 | 10.78 | 13.83 | 16.17 | | | | |
| 56 | 10.59 | 13.59 | 15.89 | | | | |
| 57 | 10.41 | 13.35 | 15.61 | | | | |
| 58 | 10.23 | 13.12 | 15.34 | | | | |
| 59 | 10.05 | 12.90 | 15.08 | | | | |
| 60 | 9.89 | 12.68 | 14.83 | | | | |
| 61 | 9.72 | 12.47 | 14.58 | | | | |
| 62 | 9.57 | 12.27 | 14.35 | | | | |
| 63 | 9.42 | 12.08 | 14.12 | | | | |
| 64 | 9.27 | 11.89 | 13.90 | | | | |
| Const's | 593.23 | 760.91 | 889.84 | Const's | 593.23 | 760.91 | 889.84 |

BAND DRIVE

Twister Twist Gear Table.

FRONT ROLL $1\frac{1}{2}$ inch Diameter.

Cylinder 7 inch Diameter.

Ratio Cylinder to Whirl 1 to 5.86.

Whirl 1 $\frac{1}{15}$ inch Diameter.

Front Roll Gear 112 Teeth

| Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|-----------------|------------------------|-------------------------|-------------------------|-----------------|------------------------|-------------------------|-------------------------|
| | Twist | Twist | Twist | | Twist | Twist | Twist |
| 21T | | | 39.79 | 65T | 8.57 | 10.71 | 12.86 |
| 22 | | | 37.98 | 66 | 8.44 | 10.55 | 12.66 |
| 23 | | | 36.33 | 67 | 8.31 | 10.39 | 12.47 |
| 24 | | 29.01 | 34.82 | 68 | 8.19 | 10.24 | 12.29 |
| 25 | | 27.85 | 33.43 | 69 | 8.07 | 10.09 | 12.11 |
| 26 | | 26.78 | 32.14 | 70 | 7.96 | 9.95 | 11.94 |
| 27 | | 25.79 | 30.95 | 71 | 7.85 | 9.81 | 11.77 |
| 28 | | 24.87 | 29.84 | 72 | 7.74 | 9.67 | 11.61 |
| 29 | | 24.01 | 28.82 | 73 | 7.63 | 9.54 | |
| 30 | | 23.21 | 27.85 | 74 | 7.53 | 9.41 | |
| 31 | | 22.46 | 26.96 | 75 | 7.43 | 9.29 | |
| 32 | | 21.76 | 26.11 | 76 | 7.33 | 9.16 | |
| 33 | | 21.10 | 25.32 | 77 | 7.23 | 9.04 | |
| 34 | | 20.48 | 24.58 | 78 | 7.14 | 8.93 | |
| 35 | | 19.89 | 23.88 | 79 | 7.05 | 8.81 | |
| 36 | | 19.34 | 23.21 | 80 | 6.96 | 8.70 | |
| 37 | | 18.82 | 22.58 | 81 | 6.88 | 8.60 | |
| 38 | | 18.32 | 21.99 | 82 | 6.79 | 8.49 | |
| 39 | | 17.85 | 21.43 | 83 | 6.71 | 8.39 | |
| 40 | | 17.41 | 20.89 | 84 | 6.63 | 8.29 | |
| 41 | | 16.98 | 20.38 | 85 | 6.55 | 8.19 | |
| 42 | | 16.58 | 19.89 | 86 | 6.48 | 8.10 | |
| 43 | | 16.19 | 19.43 | 87 | 6.40 | 8.00 | |
| 44 | | 15.83 | 18.99 | 88 | 6.33 | 7.91 | |
| 45 | 12.38 | 15.47 | 18.57 | 89 | 6.26 | 7.82 | |
| 46 | 12.11 | 15.13 | 18.17 | 90 | 6.19 | 7.74 | |
| 47 | 11.85 | 14.82 | 17.78 | 91 | 6.12 | 7.65 | |
| 48 | 11.61 | 14.51 | 17.41 | 92 | 6.05 | 7.57 | |
| 49 | 11.37 | 14.21 | 17.05 | 93 | 5.99 | 7.49 | |
| 50 | 11.14 | 13.93 | 16.71 | 94 | | 7.41 | |
| 51 | 10.92 | 13.65 | 16.38 | 95 | | 7.33 | |
| 52 | 10.71 | 13.39 | 16.07 | 96 | | 7.25 | |
| 53 | 10.51 | 13.14 | 15.77 | | | | |
| 54 | 10.31 | 12.90 | 15.47 | | | | |
| 55 | 10.13 | 12.66 | 15.19 | | | | |
| 56 | 9.95 | 12.43 | 14.92 | | | | |
| 57 | 9.77 | 12.22 | 14.66 | | | | |
| 58 | 9.61 | 12.01 | 14.41 | | | | |
| 59 | 9.44 | 11.80 | 14.16 | | | | |
| 60 | 9.28 | 11.61 | 13.93 | | | | |
| 61 | 9.13 | 11.42 | 13.70 | | | | |
| 62 | 8.98 | 11.23 | 13.48 | | | | |
| 63 | 8.84 | 11.05 | 13.26 | | | | |
| 64 | 8.70 | 10.88 | 13.06 | | | | |
| Const's | 557.10 | 696.37 | 835.65 | Const's | 557.10 | 696.37 | 835.65 |

BAND DRIVE

Twister Twist Gear Table.

FRONT ROLL $1\frac{1}{2}$ inch Diameter.

Cylinder 7 inch Diameter

Ratio Cylinder to Whirl 1 to 5.43.

Whirl $1\frac{1}{2}$ inch Diameter

Front Roll Gear 112 Teeth.

| Change | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|---------|------------------------|-------------------------|-------------------------|---------|------------------------|-------------------------|-------------------------|
| Gears | Twist | Twist | Twist | Gears | Twist | Twist | Twist |
| 21T | | | 36.87 | 65T | 7.94 | 9.93 | 11.91 |
| 22 | | | 35.20 | 66 | 7.82 | 9.78 | 11.73 |
| 23 | | | 33.67 | 67 | 7.70 | 9.63 | 11.56 |
| 24 | | 26.89 | 32.26 | 68 | 7.59 | 9.49 | 11.39 |
| 25 | | 25.81 | 30.97 | 69 | 7.48 | 9.35 | 11.22 |
| 26 | | 24.82 | 29.78 | 70 | 7.37 | 9.22 | 11.06 |
| 27 | | 23.90 | 28.68 | 71 | 7.27 | 9.09 | 10.91 |
| 28 | | 23.05 | 27.65 | 72 | 7.17 | 8.96 | 10.75 |
| 29 | | 22.25 | 26.70 | 73 | 7.07 | 8.84 | |
| 30 | | 21.51 | 25.81 | 74 | 6.98 | 8.72 | |
| 31 | | 20.82 | 24.98 | 75 | 6.88 | 8.61 | |
| 32 | | 20.17 | 24.19 | 76 | 6.79 | 8.49 | |
| 33 | | 19.55 | 23.46 | 77 | 6.70 | 8.38 | |
| 34 | | 18.98 | 22.77 | 78 | 6.62 | 8.27 | |
| 35 | | 18.44 | 22.12 | 79 | 6.53 | 8.17 | |
| 36 | | 17.92 | 21.51 | 80 | 6.45 | 8.07 | |
| 37 | | 17.44 | 20.93 | 81 | 6.37 | 7.97 | |
| 38 | | 16.98 | 20.38 | 82 | 6.30 | 7.87 | |
| 39 | | 16.55 | 19.85 | 83 | 6.22 | 7.77 | |
| 40 | | 16.13 | 19.36 | 84 | 6.15 | 7.68 | |
| 41 | | 15.74 | 18.89 | 85 | 6.07 | 7.59 | |
| 42 | | 15.36 | 18.44 | 86 | 6.00 | 7.50 | |
| 43 | | 15.01 | 18.01 | 87 | 5.93 | 7.42 | |
| 44 | | 14.67 | 17.60 | 88 | 5.87 | 7.33 | |
| 45 | 11.47 | 14.34 | 17.21 | 89 | 5.80 | 7.25 | |
| 46 | 11.22 | 14.03 | 16.83 | 90 | 5.74 | 7.17 | |
| 47 | 10.98 | 13.73 | 16.47 | 91 | 5.67 | 7.09 | |
| 48 | 10.75 | 13.44 | 16.13 | 92 | 5.61 | 7.01 | |
| 49 | 10.53 | 13.17 | 15.80 | 93 | 5.55 | 6.94 | |
| 50 | 10.33 | 12.91 | 15.49 | 94 | | 6.86 | |
| 51 | 10.12 | 12.65 | 15.18 | 95 | | 6.79 | |
| 52 | 9.93 | 12.41 | 14.89 | 96 | | 6.72 | |
| 53 | 9.74 | 12.18 | 14.61 | | | | |
| 54 | 9.56 | 11.95 | 14.34 | | | | |
| 55 | 9.39 | 11.73 | 14.08 | | | | |
| 56 | 9.22 | 11.52 | 13.83 | | | | |
| 57 | 9.06 | 11.32 | 13.58 | | | | |
| 58 | 8.90 | 11.13 | 13.35 | | | | |
| 59 | 8.75 | 10.94 | 13.12 | | | | |
| 60 | 8.60 | 10.75 | 12.91 | | | | |
| 61 | 8.46 | 10.58 | 12.69 | | | | |
| 62 | 8.33 | 10.41 | 12.49 | | | | |
| 63 | 8.19 | 10.24 | 12.29 | | | | |
| 64 | 8.07 | 10.08 | 12.10 | | | | |
| Const's | 516.22 | 645.28 | 774.33 | Const's | 516.22 | 645.28 | 774.33 |

BAND DRIVE

Twister Twist Gear Table. §

FRONT ROLL $1\frac{1}{2}$ inch Diameter.

Cylinder 7 inch Diameter. Ratio Cylinder to Whirl 1 to 4.80.

Whirl 1 $\frac{5}{16}$ inch Diameter. Front Roll Gear 112 Teeth.

| Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|-----------------|------------------------|-------------------------|-------------------------|-----------------|------------------------|-------------------------|-------------------------|
| | Twist | Twist | Twist | | Twist | Twist | Twist |
| 21T | | | 32.59 | 65T | 7.02 | 8.78 | 10.53 |
| 22 | | | 31.11 | 66 | 6.91 | 8.64 | 10.37 |
| 23 | | | 29.76 | 67 | 6.81 | 8.51 | 10.22 |
| 24 | | 23.77 | 28.52 | 68 | 6.71 | 8.39 | 10.07 |
| 25 | | 22.82 | 27.38 | 69 | 6.61 | 8.27 | 9.92 |
| 26 | | 21.94 | 26.32 | 70 | 6.52 | 8.15 | 9.78 |
| 27 | | 21.13 | 25.35 | 71 | 6.43 | 8.03 | 9.64 |
| 28 | | 20.37 | 24.45 | 72 | 6.34 | 7.92 | 9.51 |
| 29 | | 19.67 | 23.60 | 73 | 6.25 | 7.81 | |
| 30 | | 19.01 | 22.82 | 74 | 6.17 | 7.71 | |
| 31 | | 18.40 | 22.08 | 75 | 6.08 | 7.61 | |
| 32 | | 17.83 | 21.39 | 76 | 6.00 | 7.51 | |
| 33 | | 17.29 | 20.74 | 77 | 5.93 | 7.41 | |
| 34 | | 16.78 | 20.13 | 78 | 5.85 | 7.31 | |
| 35 | | 16.30 | 19.56 | 79 | 5.78 | 7.22 | |
| 36 | | 15.84 | 19.01 | 80 | 5.70 | 7.13 | |
| 37 | | 15.42 | 18.50 | 81 | 5.63 | 7.04 | |
| 38 | | 15.01 | 18.01 | 82 | 5.57 | 6.96 | |
| 39 | | 14.62 | 17.55 | 83 | 5.50 | 6.87 | |
| 40 | | 14.26 | 17.11 | 84 | 5.43 | 6.79 | |
| 41 | | 13.91 | 16.69 | 85 | 5.37 | 6.71 | |
| 42 | | 13.58 | 16.30 | 86 | 5.31 | 6.63 | |
| 43 | | 13.27 | 15.92 | 87 | 5.25 | 6.56 | |
| 44 | | 12.96 | 15.56 | 88 | 5.19 | 6.48 | |
| 45 | 10.14 | 12.68 | 15.21 | 89 | 5.13 | 6.41 | |
| 46 | 9.92 | 12.40 | 14.88 | 90 | 5.07 | 6.34 | |
| 47 | 9.71 | 12.14 | 14.56 | 91 | 5.01 | 6.27 | |
| 48 | 9.51 | 11.88 | 14.26 | 92 | 4.96 | 6.20 | |
| 49 | 9.31 | 11.64 | 13.97 | 93 | 4.91 | 6.13 | |
| 50 | 9.13 | 11.41 | 13.69 | 94 | | 6.07 | |
| 51 | 8.95 | 11.18 | 13.42 | 95 | | 6.00 | |
| 52 | 8.78 | 10.97 | 13.16 | 96 | | 5.94 | |
| 53 | 8.61 | 10.76 | 12.91 | | | | |
| 54 | 8.45 | 10.56 | 12.68 | | | | |
| 55 | 8.30 | 10.37 | 12.45 | | | | |
| 56 | 8.15 | 10.19 | 12.22 | | | | |
| 57 | 8.01 | 10.01 | 12.01 | | | | |
| 58 | 7.87 | 9.83 | 11.80 | | | | |
| 59 | 7.73 | 9.66 | 11.60 | | | | |
| 60 | 7.61 | 9.51 | 11.41 | | | | |
| 61 | 7.48 | 9.35 | 11.22 | | | | |
| 62 | 7.36 | 9.20 | 11.04 | | | | |
| 63 | 7.24 | 9.05 | 10.86 | | | | |
| 64 | 7.13 | 8.91 | 10.70 | | | | |
| Const's | 456.33 | 570.41 | 684.49 | Const's | 456.33 | 570.41 | 684.49 |

STANDARD Twister Twist Gear Table.

FRONT ROLL $1\frac{1}{2}$ inch Diameter.

Cylinder 7 inch Diameter.

Ratio Cylinder to Whirl 1 to 3.80.

Whirl $1\frac{1}{8}$ inch Diameter.

Front Roll Gear 112 Teeth.

| Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|-----------------|------------------------|-------------------------|-------------------------|-----------------|------------------------|-------------------------|-------------------------|
| | Twist | Twist | Twist | | Twist | Twist | Twist |
| 21T | | | 25.80 | 65T | 5.57 | 6.95 | 8.34 |
| 22 | | | 24.63 | 66 | 5.48 | 6.84 | 8.21 |
| 23 | | | 23.56 | 67 | 5.40 | 6.74 | 8.09 |
| 24 | | 18.82 | 22.58 | 68 | 5.32 | 6.64 | 7.97 |
| 25 | | 18.06 | 21.68 | 69 | 5.24 | 6.54 | 7.85 |
| 26 | | 17.37 | 20.84 | 70 | 5.17 | 6.45 | 7.74 |
| 27 | | 16.72 | 20.07 | 71 | 5.10 | 6.36 | 7.63 |
| 28 | | 16.13 | 19.35 | 72 | 5.03 | 6.27 | 7.53 |
| 29 | | 15.57 | 18.69 | 73 | 4.96 | 6.19 | |
| 30 | | 15.05 | 18.06 | 74 | 4.89 | 6.10 | |
| 31 | | 14.57 | 17.48 | 75 | 4.82 | 6.02 | |
| 32 | | 14.11 | 16.93 | 76 | 4.76 | 5.94 | |
| 33 | | 13.68 | 16.42 | 77 | 4.70 | 5.86 | |
| 34 | | 13.28 | 15.94 | 78 | 4.64 | 5.79 | |
| 35 | | 12.90 | 15.48 | 79 | 4.58 | 5.72 | |
| 36 | | 12.54 | 15.05 | 80 | 4.52 | 5.64 | |
| 37 | | 12.20 | 14.65 | 81 | 4.47 | 5.57 | |
| 38 | | 11.88 | 14.26 | 82 | 4.41 | 5.51 | |
| 39 | | 11.58 | 13.89 | 83 | 4.36 | 5.44 | |
| 40 | | 11.29 | 13.55 | 84 | 4.31 | 5.38 | |
| 41 | | 11.01 | 13.22 | 85 | 4.26 | 5.31 | |
| 42 | | 10.75 | 12.90 | 86 | 4.21 | 5.25 | |
| 43 | | 10.50 | 12.60 | 87 | 4.16 | 5.19 | |
| 44 | | 10.26 | 12.32 | 88 | 4.11 | 5.13 | |
| 45 | 8.04 | 10.03 | 12.04 | 89 | 4.07 | 5.07 | |
| 46 | 7.87 | 9.82 | 11.78 | 90 | 4.02 | 5.02 | |
| 47 | 7.70 | 9.61 | 11.53 | 91 | 3.98 | 4.96 | |
| 48 | 7.54 | 9.41 | 11.29 | 92 | 3.93 | 4.91 | |
| 49 | 7.38 | 9.22 | 11.06 | 93 | 3.89 | 4.86 | |
| 50 | 7.24 | 9.03 | 10.84 | 94 | | 4.80 | |
| 51 | 7.10 | 8.85 | 10.63 | 95 | | 4.75 | |
| 52 | 6.96 | 8.68 | 10.42 | 96 | | 4.70 | |
| 53 | 6.83 | 8.52 | 10.22 | | | | |
| 54 | 6.70 | 8.36 | 10.04 | | | | |
| 55 | 6.58 | 8.21 | 9.85 | | | | |
| 56 | 6.46 | 8.06 | 9.68 | | | | |
| 57 | 6.35 | 7.92 | 9.51 | | | | |
| 58 | 6.24 | 7.79 | 9.34 | | | | |
| 59 | 6.13 | 7.65 | 9.18 | | | | |
| 60 | 6.03 | 7.52 | 9.03 | | | | |
| 61 | 5.93 | 7.40 | 8.88 | | | | |
| 62 | 5.84 | 7.28 | 8.74 | | | | |
| 63 | 5.74 | 7.17 | 8.60 | | | | |
| 64 | 5.65 | 7.05 | 8.47 | | | | |
| Const's | 361.85 | 451.57 | 541.89 | Const's | 361.85 | 451.57 | 541.89 |

BAND DRIVE

Twister Twist Gear Table.

FRONT ROLL $1\frac{1}{2}$ inch Diameter.

Cylinder 7 inch Diameter. Ratio Cylinder to Whirl 1 to 3.70.

Whirl $1\frac{1}{4}$ inch Diameter. Front Roll Gear 112 Teeth.

| Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|-----------------|------------------------|-------------------------|-------------------------|-----------------|------------------------|-------------------------|-------------------------|
| | Twist | Twist | Twist | | Twist | Twist | Twist |
| 21T | | | 25.13 | 65T | 5.41 | 6.76 | 8.12 |
| 22 | | | 23.98 | 66 | 5.33 | 6.66 | 7.99 |
| 23 | | | 22.94 | 67 | 5.25 | 6.56 | 7.88 |
| 24 | | 18.32 | 21.98 | 68 | 5.17 | 6.47 | 7.76 |
| 25 | | 17.59 | 21.12 | 69 | 5.10 | 6.37 | 7.65 |
| 26 | | 16.91 | 20.29 | 70 | 5.03 | 6.28 | 7.54 |
| 27 | | 16.28 | 19.54 | 71 | 4.95 | 6.19 | 7.43 |
| 28 | | 15.70 | 18.84 | 72 | 4.89 | 6.11 | 7.33 |
| 29 | | 15.16 | 18.19 | 73 | 4.82 | 6.02 | |
| 30 | | 14.66 | 17.59 | 74 | 4.75 | 5.94 | |
| 31 | | 14.18 | 17.02 | 75 | 4.69 | 5.86 | |
| 32 | | 13.74 | 16.49 | 76 | 4.63 | 5.79 | |
| 33 | | 13.32 | 15.99 | 77 | 4.57 | 5.71 | |
| 34 | | 12.93 | 15.52 | 78 | 4.51 | 5.64 | |
| 35 | | 12.56 | 15.08 | 79 | 4.45 | 5.57 | |
| 36 | | 12.21 | 14.66 | 80 | 4.40 | 5.50 | |
| 37 | | 11.88 | 14.26 | 81 | 4.34 | 5.43 | |
| 38 | | 11.57 | 13.89 | 82 | 4.29 | 5.36 | |
| 39 | | 11.27 | 13.53 | 83 | 4.24 | 5.30 | |
| 40 | | 10.98 | 13.19 | 84 | 4.19 | 5.23 | |
| 41 | | 10.72 | 12.87 | 85 | 4.14 | 5.17 | |
| 42 | | 10.47 | 12.56 | 86 | 4.09 | 5.11 | |
| 43 | | 10.23 | 12.27 | 87 | 4.04 | 5.05 | |
| 44 | | 9.99 | 11.99 | 88 | 4.00 | 5.00 | |
| 45 | 7.82 | 9.77 | 11.73 | 89 | 3.95 | 4.94 | |
| 46 | 7.65 | 9.56 | 11.47 | 90 | 3.91 | 4.89 | |
| 47 | 7.48 | 9.36 | 11.23 | 91 | 3.87 | 4.83 | |
| 48 | 7.33 | 9.16 | 10.99 | 92 | 3.82 | 4.78 | |
| 49 | 7.18 | 8.97 | 10.77 | 93 | 3.78 | 4.73 | |
| 50 | 7.03 | 8.79 | 10.55 | 94 | | 4.68 | |
| 51 | 6.90 | 8.62 | 10.35 | 95 | | 4.63 | |
| 52 | 6.76 | 8.46 | 10.15 | 96 | | 4.58 | |
| 53 | 6.64 | 8.30 | 9.96 | | | | |
| 54 | 6.51 | 8.14 | 9.77 | | | | |
| 55 | 6.40 | 7.99 | 9.59 | | | | |
| 56 | 6.28 | 7.85 | 9.42 | | | | |
| 57 | 6.17 | 7.71 | 9.26 | | | | |
| 58 | 6.06 | 7.58 | 9.10 | | | | |
| 59 | 5.96 | 7.45 | 8.94 | | | | |
| 60 | 5.86 | 7.33 | 8.79 | | | | |
| 61 | 5.77 | 7.21 | 8.65 | | | | |
| 62 | 5.67 | 7.09 | 8.51 | | | | |
| 63 | 5.58 | 6.97 | 8.38 | | | | |
| 64 | 5.50 | 6.87 | 8.24 | | | | |
| Const's | 351.75 | 439.69 | 527.63 | Const's | 351.75 | 439.69 | 527.63 |

BAND DRIVE

Twister Twist Gear Table.

FRONT ROLL 1½ inch Diameter

Cylinder 7 inch Diameter. Ratio Cylinder to Whirl 1 to 3.41
Whirl 2 inch Diameter Front Roll Gear 112 Teeth

| Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|-----------------|------------------------|-------------------------|-------------------------|-----------------|------------------------|-------------------------|-------------------------|
| | Twist | Twist | Twist | | Twist | Twist | Twist |
| 21T | | | 23.16 | 65T | 4.99 | 6.23 | 7.48 |
| 22 | | | 22.10 | 66 | 4.91 | 6.14 | 7.37 |
| 23 | | | 21.14 | 67 | 4.83 | 6.05 | 7.26 |
| 24 | | 16.88 | 20.26 | 68 | 4.77 | 5.96 | 7.15 |
| 25 | | 16.21 | 19.45 | 69 | 4.70 | 5.87 | 7.05 |
| 26 | | 15.59 | 18.70 | 70 | 4.63 | 5.79 | 6.95 |
| 27 | | 15.01 | 18.01 | 71 | 4.57 | 5.71 | 6.85 |
| 28 | | 14.47 | 17.37 | 72 | 4.50 | 5.63 | 6.75 |
| 29 | | 13.97 | 16.77 | 73 | 4.44 | 5.55 | |
| 30 | | 13.51 | 16.21 | 74 | 4.38 | 5.48 | |
| 31 | | 13.07 | 15.69 | 75 | 4.32 | 5.40 | |
| 32 | | 12.66 | 15.20 | 76 | 4.27 | 5.33 | |
| 33 | | 12.28 | 14.74 | 77 | 4.21 | 5.26 | |
| 34 | | 11.92 | 14.30 | 78 | 4.16 | 5.20 | |
| 35 | | 11.59 | 13.89 | 79 | 4.11 | 5.13 | |
| 36 | | 11.26 | 13.51 | 80 | 4.05 | 5.07 | |
| 37 | | 10.95 | 13.14 | 81 | 4.00 | 5.00 | |
| 38 | | 10.66 | 12.80 | 82 | 3.95 | 4.94 | |
| 39 | | 10.39 | 12.47 | 83 | 3.91 | 4.88 | |
| 40 | | 10.13 | 12.16 | 84 | 3.86 | 4.82 | |
| 41 | | 9.88 | 11.86 | 85 | 3.81 | 4.77 | |
| 42 | | 9.65 | 11.58 | 86 | 3.77 | 4.71 | |
| 43 | | 9.42 | 11.31 | 87 | 3.73 | 4.66 | |
| 44 | | 9.21 | 11.05 | 88 | 3.68 | 4.60 | |
| 45 | 7.20 | 9.01 | 10.81 | 89 | 3.64 | 4.55 | |
| 46 | 7.05 | 8.81 | 10.57 | 90 | 3.60 | 4.50 | |
| 47 | 6.90 | 8.62 | 10.35 | 91 | 3.56 | 4.45 | |
| 48 | 6.75 | 8.44 | 10.13 | 92 | 3.52 | 4.40 | |
| 49 | 6.62 | 8.27 | 9.92 | 93 | 3.49 | 4.36 | |
| 50 | 6.48 | 8.10 | 9.73 | 94 | | 4.31 | |
| 51 | 6.36 | 7.95 | 9.53 | 95 | | 4.27 | |
| 52 | 6.24 | 7.79 | 9.35 | 96 | | 4.22 | |
| 53 | 6.12 | 7.65 | 9.17 | | | | |
| 54 | 6.00 | 7.50 | 9.01 | | | | |
| 55 | 5.89 | 7.37 | 8.84 | | | | |
| 56 | 5.79 | 7.24 | 8.68 | | | | |
| 57 | 5.69 | 7.11 | 8.53 | | | | |
| 58 | 5.59 | 6.99 | 8.38 | | | | |
| 59 | 5.49 | 6.87 | 8.24 | | | | |
| 60 | 5.40 | 6.75 | 8.10 | | | | |
| 61 | 5.31 | 6.64 | 7.97 | | | | |
| 62 | 5.23 | 6.56 | 7.84 | | | | |
| 63 | 5.15 | 6.43 | 7.72 | | | | |
| 64 | 5.07 | 6.33 | 7.60 | | | | |
| Const's | 324.18 | 405.23 | 486.27 | Const's | 324.18 | 405.23 | 486.27 |

BAND DRIVE

Twister Twist Gear Table.

FRONT ROLL $1\frac{1}{2}$ inch Diameter.

Cylinder 7 inch Diameter Ratio Cylinder to Whirl 1 to 2.66.

Whirl $2\frac{1}{2}$ inch Diameter Front Roll Gear 112 teeth.

| Change | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|---------|------------------------|-------------------------|-------------------------|---------|------------------------|-------------------------|-------------------------|
| Gears | Twist | Twist | Twist | Gears | Twist | Twist | Twist |
| 21T | | | 18.06 | 65T | 3.89 | 4.86 | 5.84 |
| 22 | | | 17.24 | 66 | 3.83 | 4.79 | 5.75 |
| 23 | | | 16.49 | 67 | 3.77 | 4.72 | 5.66 |
| 24 | | 13.17 | 15.81 | 68 | 3.72 | 4.65 | 5.58 |
| 25 | | 12.64 | 15.17 | 69 | 3.66 | 4.58 | 5.50 |
| 26 | | 12.16 | 14.59 | 70 | 3.61 | 4.52 | 5.42 |
| 27 | | 11.71 | 14.05 | 71 | 3.56 | 4.45 | 5.34 |
| 28 | | 11.29 | 13.55 | 72 | 3.51 | 4.39 | 5.27 |
| 29 | | 10.90 | 13.08 | 73 | 3.46 | 4.33 | |
| 30 | | 10.54 | 12.64 | 74 | 3.42 | 4.27 | |
| 31 | | 10.20 | 12.24 | 75 | 3.37 | 4.21 | |
| 32 | | 9.88 | 11.85 | 76 | 3.33 | 4.16 | |
| 33 | | 9.58 | 11.49 | 77 | 3.28 | 4.11 | |
| 34 | | 9.30 | 11.16 | 78 | 3.24 | 4.05 | |
| 35 | | 9.03 | 10.84 | 79 | 3.20 | 4.00 | |
| 36 | | 8.78 | 10.54 | 80 | 3.16 | 3.95 | |
| 37 | | 8.54 | 10.25 | 81 | 3.12 | 3.90 | |
| 38 | | 8.32 | 9.98 | 82 | 3.08 | 3.85 | |
| 39 | | 8.11 | 9.73 | 83 | 3.05 | 3.81 | |
| 40 | | 7.90 | 9.48 | 84 | 3.01 | 3.76 | |
| 41 | | 7.71 | 9.25 | 85 | 2.98 | 3.72 | |
| 42 | | 7.53 | 9.03 | 86 | 2.94 | 3.68 | |
| 43 | | 7.35 | 8.82 | 87 | 2.91 | 3.63 | |
| 44 | | 7.18 | 8.62 | 88 | 2.87 | 3.59 | |
| 45 | 5.62 | 7.02 | 8.43 | 89 | 2.84 | 3.55 | |
| 46 | 5.49 | 6.87 | 8.25 | 90 | 2.81 | 3.51 | |
| 47 | 5.38 | 6.73 | 8.07 | 91 | 2.78 | 3.47 | |
| 48 | 5.27 | 6.59 | 7.90 | 92 | 2.75 | 3.44 | |
| 49 | 5.16 | 6.45 | 7.74 | 93 | 2.72 | 3.40 | |
| 50 | 5.06 | 6.32 | 7.59 | 94 | | 3.36 | |
| 51 | 4.96 | 6.20 | 7.44 | 95 | | 3.33 | |
| 52 | 4.86 | 6.08 | 7.29 | 96 | | 3.29 | |
| 53 | 4.77 | 5.96 | 7.16 | | | | |
| 54 | 4.68 | 5.85 | 7.02 | | | | |
| 55 | 4.60 | 5.75 | 6.90 | | | | |
| 56 | 4.52 | 5.64 | 6.77 | | | | |
| 57 | 4.44 | 5.55 | 6.65 | | | | |
| 58 | 4.36 | 5.45 | 6.54 | | | | |
| 59 | 4.29 | 5.36 | 6.43 | | | | |
| 60 | 4.21 | 5.27 | 6.32 | | | | |
| 61 | 4.15 | 5.18 | 6.22 | | | | |
| 62 | 4.08 | 5.10 | 6.12 | | | | |
| 63 | 4.01 | 5.02 | 6.02 | | | | |
| 64 | 3.95 | 4.94 | 5.93 | | | | |
| Const's | 252.88 | 316.10 | 379.32 | Const's | 252.88 | 316.10 | 379.32 |

BAND DRIVE

Twister Twist Gear Table.

FRONT ROLL $1\frac{1}{2}$ inch Diameter.

Cylinder 8 inch Diameter Ratio Cylinder to Whirl 1 to 8.28

Whirl $\frac{1}{4}$ inch Diameter Front Roll Gear 112 teeth.

| Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|-----------------|------------------------|-------------------------|-------------------------|-----------------|------------------------|-------------------------|-------------------------|
| | Twist | Twist | Twist | | Twist | Twist | Twist |
| 21 T | | | 56.23 | 65 T | 12.11 | 15.14 | 18.17 |
| 22 | | | 53.67 | 66 | 11.93 | 14.91 | 17.89 |
| 23 | | | 51.34 | 67 | 11.75 | 14.69 | 17.62 |
| 24 | | 41.00 | 49.20 | 68 | 11.58 | 14.47 | 17.36 |
| 25 | | 39.36 | 47.23 | 69 | 11.41 | 14.26 | 17.11 |
| 26 | | 37.84 | 45.41 | 70 | 11.25 | 14.06 | 16.87 |
| 27 | | 36.44 | 43.73 | 71 | 11.09 | 13.86 | 16.63 |
| 28 | | 35.14 | 42.17 | 72 | 10.93 | 13.67 | 16.40 |
| 29 | | 33.93 | 40.72 | 73 | 10.78 | 13.48 | |
| 30 | | 32.80 | 39.36 | 74 | 10.64 | 13.30 | |
| 31 | | 31.74 | 38.09 | 75 | 10.50 | 13.12 | |
| 32 | | 30.75 | 36.90 | 76 | 10.36 | 12.95 | |
| 33 | | 29.82 | 35.78 | 77 | 10.22 | 12.78 | |
| 34 | | 28.94 | 34.73 | 78 | 10.09 | 12.61 | |
| 35 | | 28.11 | 33.74 | 79 | 9.96 | 12.46 | |
| 36 | | 27.33 | 32.80 | 80 | 9.84 | 12.30 | |
| 37 | | 26.59 | 31.91 | 81 | 9.72 | 12.15 | |
| 38 | | 25.89 | 31.07 | 82 | 9.60 | 12.00 | |
| 39 | | 25.23 | 30.28 | 83 | 9.48 | 11.85 | |
| 40 | | 24.60 | 29.52 | 84 | 9.37 | 11.71 | |
| 41 | | 24.00 | 28.80 | 85 | 9.26 | 11.58 | |
| 42 | | 23.43 | 28.11 | 86 | 9.15 | 11.44 | |
| 43 | | 22.88 | 27.45 | 87 | 9.05 | 11.31 | |
| 44 | | 22.36 | 26.84 | 88 | 8.95 | 11.18 | |
| 45 | 17.49 | 21.87 | 26.24 | 89 | 8.84 | 11.06 | |
| 46 | 17.11 | 21.39 | 25.67 | 90 | 8.75 | 10.93 | |
| 47 | 16.75 | 20.94 | 25.12 | 91 | 8.65 | 10.81 | |
| 48 | 16.40 | 20.50 | 24.60 | 92 | 8.56 | 10.70 | |
| 49 | 16.06 | 20.08 | 24.10 | 93 | 8.46 | 10.58 | |
| 50 | 15.74 | 19.68 | 23.62 | 94 | | 10.47 | |
| 51 | 15.43 | 19.29 | 23.15 | 95 | | 10.36 | |
| 52 | 15.14 | 18.92 | 22.71 | 96 | | 10.25 | |
| 53 | 14.85 | 18.57 | 22.28 | | | | |
| 54 | 14.58 | 18.22 | 21.87 | | | | |
| 55 | 14.31 | 17.89 | 21.47 | | | | |
| 56 | 14.06 | 17.57 | 21.08 | | | | |
| 57 | 13.81 | 17.26 | 20.71 | | | | |
| 58 | 13.57 | 16.96 | 20.36 | | | | |
| 59 | 13.34 | 16.68 | 20.01 | | | | |
| 60 | 13.12 | 16.40 | 19.68 | | | | |
| 61 | 12.90 | 16.13 | 19.36 | | | | |
| 62 | 12.70 | 15.87 | 19.04 | | | | |
| 63 | 12.49 | 15.62 | 18.74 | | | | |
| 64 | 12.30 | 15.37 | 18.45 | | | | |
| Const's | 787.17 | 983.95 | 1180.75 | Const's | 787.17 | 983.95 | 1180.75 |

BAND DRIVE

Twister Twist Gear Table.

FRONT ROLL $1\frac{1}{2}$ inch Diameter.

Cylinder 8 inch Diameter Ratio Cylinder to Whirl 1 to 7.67.

Whirl $1\frac{5}{16}$ inch Diameter Front Roll Gear 112 Teeth.

| Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|-----------------|------------------------|-------------------------|-------------------------|-----------------|------------------------|-------------------------|-------------------------|
| | Twist | Twist | Twist | | Twist | Twist | Twist |
| 21T | | | 52.08 | 65T | 11.22 | 14.02 | 16.83 |
| 22 | | | 49.72 | 66 | 11.05 | 13.81 | 16.57 |
| 23 | | | 47.55 | 67 | 10.88 | 13.60 | 16.32 |
| 24 | | 37.97 | 45.57 | 68 | 10.72 | 13.40 | 16.08 |
| 25 | | 36.46 | 43.75 | 69 | 10.57 | 13.21 | 15.85 |
| 26 | | 35.06 | 42.07 | 70 | 10.42 | 13.02 | 15.63 |
| 27 | | 33.76 | 40.51 | 71 | 10.27 | 12.84 | 15.42 |
| 28 | | 32.55 | 39.06 | 72 | 10.13 | 12.66 | 15.19 |
| 29 | | 31.43 | 37.72 | 73 | 9.99 | 12.49 | |
| 30 | | 30.37 | 36.46 | 74 | 9.85 | 12.32 | |
| 31 | | 29.40 | 35.28 | 75 | 9.72 | 12.15 | |
| 32 | | 28.48 | 34.18 | 76 | 9.59 | 11.99 | |
| 33 | | 27.62 | 33.14 | 77 | 9.47 | 11.84 | |
| 34 | | 26.81 | 32.17 | 78 | 9.35 | 11.70 | |
| 35 | | 26.04 | 31.25 | 79 | 9.23 | 11.54 | |
| 36 | | 25.32 | 30.38 | 80 | 9.11 | 11.39 | |
| 37 | | 24.63 | 29.56 | 81 | 9.00 | 11.25 | |
| 38 | | 23.99 | 28.78 | 82 | 8.89 | 11.12 | |
| 39 | | 23.37 | 28.05 | 83 | 8.79 | 10.98 | |
| 40 | | 22.79 | 27.34 | 84 | 8.68 | 10.85 | |
| 41 | | 22.23 | 26.68 | 85 | 8.58 | 10.72 | |
| 42 | | 21.70 | 26.04 | 86 | 8.48 | 10.60 | |
| 43 | | 21.20 | 25.44 | 87 | 8.38 | 10.48 | |
| 44 | | 20.72 | 24.86 | 88 | 8.29 | 10.36 | |
| 45 | 16.20 | 20.25 | 24.31 | 89 | 8.19 | 10.24 | |
| 46 | 15.85 | 19.81 | 23.78 | 90 | 8.10 | 10.13 | |
| 47 | 15.51 | 19.39 | 23.27 | 91 | 8.01 | 10.02 | |
| 48 | 15.19 | 18.99 | 22.79 | 92 | 7.93 | 9.91 | |
| 49 | 14.88 | 18.60 | 22.32 | 93 | 7.84 | 9.80 | |
| 50 | 14.58 | 18.23 | 21.88 | 94 | | 9.70 | |
| 51 | 14.30 | 17.87 | 21.45 | 95 | | 9.59 | |
| 52 | 14.02 | 17.53 | 21.03 | 96 | | 9.49 | |
| 53 | 13.76 | 17.20 | 20.64 | | | | |
| 54 | 13.50 | 16.88 | 20.25 | | | | |
| 55 | 13.26 | 16.57 | 19.89 | | | | |
| 56 | 13.02 | 16.27 | 19.53 | | | | |
| 57 | 12.79 | 15.99 | 19.19 | | | | |
| 58 | 12.57 | 15.71 | 18.86 | | | | |
| 59 | 12.36 | 15.45 | 18.54 | | | | |
| 60 | 12.15 | 15.19 | 18.23 | | | | |
| 61 | 11.95 | 14.94 | 17.93 | | | | |
| 62 | 11.76 | 14.70 | 17.64 | | | | |
| 63 | 11.57 | 14.47 | 17.36 | | | | |
| 64 | 11.39 | 14.24 | 17.09 | | | | |
| Const's | 729.17 | 911.47 | 1093.76 | Const's | 729.17 | 911.47 | 1093.76 |

BAND DRIVE

Twister Twist Gear Table.

FRONT ROLL $1\frac{1}{2}$ inch Diameter

Cylinder 8 inches Diameter. Ratio Cylinder to Whirl 1 to 7.08

Whirl 1 inch Diameter. Front Roll Gear 112 Teeth

| Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|-----------------|------------------------|-------------------------|-------------------------|-----------------|------------------------|-------------------------|-------------------------|
| | Twist | Twist | Twist | | Twist | Twist | Twist |
| 21T | | | 48.08 | 65T | 10.36 | 12.93 | 15.53 |
| 22 | | | 45.89 | 66 | 10.20 | 12.75 | 15.30 |
| 23 | | | 43.85 | 67 | 10.05 | 12.56 | 15.07 |
| 24 | | 35.06 | 42.07 | 68 | 9.90 | 12.37 | 14.85 |
| 25 | | 33.65 | 40.38 | 69 | 9.75 | 12.19 | 14.63 |
| 26 | | 32.40 | 38.83 | 70 | 9.61 | 12.02 | 14.42 |
| 27 | | 31.16 | 37.39 | 71 | 9.48 | 11.85 | 14.22 |
| 28 | | 30.05 | 36.06 | 72 | 9.35 | 11.69 | 14.03 |
| 29 | | 29.01 | 34.81 | 73 | 9.22 | 11.53 | |
| 30 | | 28.04 | 33.65 | 74 | 9.10 | 11.37 | |
| 31 | | 27.14 | 32.57 | 75 | 8.97 | 11.22 | |
| 32 | | 26.29 | 31.55 | 76 | 8.86 | 11.07 | |
| 33 | | 25.49 | 30.59 | 77 | 8.74 | 10.93 | |
| 34 | | 24.74 | 29.69 | 78 | 8.63 | 10.79 | |
| 35 | | 24.04 | 28.85 | 79 | 8.52 | 10.65 | |
| 36 | | 23.37 | 28.04 | 80 | 8.41 | 10.52 | |
| 37 | | 22.74 | 27.29 | 81 | 8.31 | 10.39 | |
| 38 | | 22.14 | 26.57 | 82 | 8.21 | 10.26 | |
| 39 | | 21.57 | 25.89 | 83 | 8.11 | 10.14 | |
| 40 | | 21.01 | 25.24 | 84 | 8.01 | 10.02 | |
| 41 | | 20.52 | 24.63 | 85 | 7.92 | 9.89 | |
| 42 | | 20.03 | 24.04 | 86 | 7.83 | 9.78 | |
| 43 | | 19.57 | 23.48 | 87 | 7.74 | 9.67 | |
| 44 | | 19.12 | 22.95 | 88 | 7.65 | 9.56 | |
| 45 | 14.96 | 18.69 | 22.44 | 89 | 7.56 | 9.45 | |
| 46 | 14.63 | 18.29 | 21.95 | 90 | 7.48 | 9.35 | |
| 47 | 14.32 | 17.90 | 21.48 | 91 | 7.40 | 9.25 | |
| 48 | 14.02 | 17.52 | 21.03 | 92 | 7.32 | 9.15 | |
| 49 | 13.74 | 17.17 | 20.60 | 93 | 7.24 | 9.05 | |
| 50 | 13.46 | 16.82 | 20.19 | 94 | | 8.95 | |
| 51 | 13.19 | 16.50 | 19.80 | 95 | | 8.86 | |
| 52 | 12.94 | 16.18 | 19.42 | 96 | | 8.76 | |
| 53 | 12.70 | 15.87 | 19.05 | | | | |
| 54 | 12.46 | 15.58 | 18.70 | | | | |
| 55 | 12.24 | 15.30 | 18.36 | | | | |
| 56 | 12.02 | 15.02 | 18.02 | | | | |
| 57 | 11.81 | 14.76 | 17.71 | | | | |
| 58 | 11.61 | 14.51 | 17.41 | | | | |
| 59 | 11.41 | 14.26 | 17.11 | | | | |
| 60 | 11.22 | 14.02 | 16.83 | | | | |
| 61 | 11.03 | 13.79 | 16.55 | | | | |
| 62 | 10.86 | 13.57 | 16.28 | | | | |
| 63 | 10.68 | 13.35 | 16.03 | | | | |
| 64 | 10.52 | 13.15 | 15.78 | | | | |
| Const's | 673.08 | 841.35 | 1009.63 | Const's | 673.08 | 841.35 | 1009.63 |

BAND DRIVE

Twister Twist Gear Table.

FRONT ROLL $1\frac{1}{2}$ Inch Diameter.

Cylinder 8 inches Diameter. Ratio Cylinder to Whirl 1 to 6.80

Whirl $1\frac{1}{16}$ inch Diameter. Front Roll Gear 112 Teeth

| Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|-----------------|------------------------|-------------------------|-------------------------|-----------------|------------------------|-------------------------|-------------------------|
| | Twist | Twist | Twist | | Twist | Twist | Twist |
| 21T | | | 46.18 | 65T | 9.95 | 12.43 | 14.92 |
| 22 | | | 44.08 | 66 | 9.79 | 12.24 | 14.69 |
| 23 | | | 42.16 | 67 | 9.65 | 12.06 | 14.47 |
| 24 | | 33.67 | 40.40 | 68 | 9.51 | 11.88 | 14.26 |
| 25 | | 32.32 | 38.79 | 69 | 9.37 | 11.71 | 14.05 |
| 26 | | 31.08 | 37.30 | 70 | 9.24 | 11.54 | 13.85 |
| 27 | | 29.93 | 35.91 | 71 | 9.11 | 11.38 | 13.66 |
| 28 | | 28.86 | 34.63 | 72 | 8.98 | 11.22 | 13.47 |
| 29 | | 27.86 | 33.44 | 73 | 8.86 | 11.07 | |
| 30 | | 26.94 | 32.32 | 74 | 8.74 | 10.92 | |
| 31 | | 26.07 | 31.28 | 75 | 8.62 | 10.77 | |
| 32 | | 25.25 | 30.30 | 76 | 8.51 | 10.63 | |
| 33 | | 24.49 | 29.38 | 77 | 8.40 | 10.49 | |
| 34 | | 23.77 | 28.52 | 78 | 8.29 | 10.36 | |
| 35 | | 23.09 | 27.71 | 79 | 8.18 | 10.23 | |
| 36 | | 22.45 | 26.94 | 80 | 8.08 | 10.10 | |
| 37 | | 21.84 | 26.21 | 81 | 7.98 | 9.98 | |
| 38 | | 21.27 | 25.52 | 82 | 7.88 | 9.85 | |
| 39 | | 20.72 | 24.86 | 83 | 7.79 | 9.74 | |
| 40 | | 20.20 | 24.24 | 84 | 7.70 | 9.62 | |
| 41 | | 19.71 | 23.65 | 85 | 7.61 | 9.51 | |
| 42 | | 19.24 | 23.09 | 86 | 7.52 | 9.40 | |
| 43 | | 18.79 | 22.55 | 87 | 7.43 | 9.29 | |
| 44 | | 18.37 | 22.04 | 88 | 7.35 | 9.18 | |
| 45 | 14.37 | 17.96 | 21.55 | 89 | 7.26 | 9.08 | |
| 46 | 14.05 | 17.57 | 21.08 | 90 | 7.18 | 8.97 | |
| 47 | 13.75 | 17.19 | 20.63 | 91 | 7.10 | 8.88 | |
| 48 | 13.47 | 16.84 | 20.20 | 92 | 7.03 | 8.78 | |
| 49 | 13.19 | 16.49 | 19.79 | 93 | 6.95 | 8.69 | |
| 50 | 12.93 | 16.16 | 19.39 | 94 | | 8.60 | |
| 51 | 12.68 | 15.84 | 19.01 | 95 | | 8.51 | |
| 52 | 12.43 | 15.54 | 18.65 | 96 | | 8.42 | |
| 53 | 12.20 | 15.25 | 18.30 | | | | |
| 54 | 11.97 | 14.96 | 17.96 | | | | |
| 55 | 11.75 | 14.69 | 17.63 | | | | |
| 56 | 11.54 | 14.43 | 17.32 | | | | |
| 57 | 11.34 | 14.18 | 17.01 | | | | |
| 58 | 11.15 | 13.93 | 16.72 | | | | |
| 59 | 10.96 | 13.70 | 16.44 | | | | |
| 60 | 10.77 | 13.46 | 16.16 | | | | |
| 61 | 10.60 | 13.25 | 15.90 | | | | |
| 62 | 10.43 | 13.03 | 15.64 | | | | |
| 63 | 10.26 | 12.83 | 15.39 | | | | |
| 64 | 10.10 | 12.63 | 15.15 | | | | |
| Const's | 646.46 | 808.08 | 969.70 | Const's | 646.46 | 808.08 | 969.70 |

BAND DRIVE Twister Twist Gear Table.

FRONT ROLL $1\frac{1}{2}$ inch Diameter.

Cylinder 8 inch Diameter. Ratio Cylinder to Whirl 1 to 6.22.

Whirl $1\frac{1}{8}$ inch Diameter. Front Roll Gear 112 Teeth

| Change | Cyl. 20 T | Cyl. 20 T | Cyl. 20 T | Change | Cyl. 20 T | Cyl. 20 T | Cyl. 20 T |
|---------|-----------|------------|------------|---------|-----------|------------|------------|
| Gears | Stud 80 T | Stud 100 T | Stud 120 T | Gears | Stud 80 T | Stud 100 T | Stud 120 T |
| | Twist | Twist | Twist | | Twist | Twist | Twist |
| 21 T | | | 42.24 | 65 1 | 9.10 | 11.38 | 13.65 |
| 22 | | | 40.32 | 66 | 8.96 | 11.20 | 13.44 |
| 23 | | | 38.56 | 67 | 8.82 | 11.03 | 13.24 |
| 24 | | 30.80 | 36.96 | 68 | 8.70 | 10.87 | 13.04 |
| 25 | | 29.57 | 35.48 | 69 | 8.57 | 10.72 | 12.86 |
| 26 | | 28.43 | 34.12 | 70 | 8.45 | 10.56 | 12.67 |
| 27 | | 27.38 | 32.85 | 71 | 8.31 | 10.41 | 12.49 |
| 28 | | 26.40 | 31.68 | 72 | 8.21 | 10.27 | 12.32 |
| 29 | | 25.49 | 30.59 | 73 | 8.10 | 10.13 | |
| 30 | | 24.64 | 29.57 | 74 | 7.99 | 9.99 | |
| 31 | | 23.84 | 28.61 | 75 | 7.88 | 9.87 | |
| 32 | | 23.10 | 27.72 | 76 | 7.78 | 9.75 | |
| 33 | | 22.40 | 26.88 | 77 | 7.68 | 9.61 | |
| 34 | | 21.74 | 26.09 | 78 | 7.58 | 9.47 | |
| 35 | | 21.12 | 25.34 | 79 | 7.49 | 9.36 | |
| 36 | | 20.53 | 24.64 | 80 | 7.39 | 9.24 | |
| 37 | | 19.98 | 23.97 | 81 | 7.30 | 9.12 | |
| 38 | | 19.45 | 23.34 | 82 | 7.21 | 9.01 | |
| 39 | | 18.95 | 22.74 | 83 | 7.12 | 8.91 | |
| 40 | | 18.48 | 22.17 | 84 | 7.04 | 8.80 | |
| 41 | | 18.03 | 21.63 | 85 | 6.96 | 8.69 | |
| 42 | | 17.60 | 21.12 | 86 | 6.88 | 8.59 | |
| 43 | | 17.19 | 20.64 | 87 | 6.80 | 8.49 | |
| 44 | | 16.80 | 20.16 | 88 | 6.72 | 8.40 | |
| 45 | 13.14 | 16.43 | 19.72 | 89 | 6.64 | 8.31 | |
| 46 | 12.85 | 16.07 | 19.28 | 90 | 6.57 | 8.22 | |
| 47 | 12.58 | 15.73 | 18.88 | 91 | 6.50 | 8.13 | |
| 48 | 12.32 | 15.40 | 18.48 | 92 | 6.43 | 8.04 | |
| 49 | 12.07 | 15.08 | 18.11 | 93 | 6.36 | 7.95 | |
| 50 | 11.83 | 14.78 | 17.74 | 94 | | 7.87 | |
| 51 | 11.60 | 14.49 | 17.40 | 95 | | 7.78 | |
| 52 | 11.37 | 14.21 | 17.06 | 96 | | 7.70 | |
| 53 | 11.16 | 13.95 | 16.74 | | | | |
| 54 | 10.95 | 13.69 | 16.42 | | | | |
| 55 | 10.75 | 13.45 | 16.13 | | | | |
| 56 | 10.56 | 13.20 | 15.84 | | | | |
| 57 | 10.37 | 12.97 | 15.57 | | | | |
| 58 | 10.20 | 12.74 | 15.29 | | | | |
| 59 | 10.02 | 12.53 | 15.03 | | | | |
| 60 | 9.86 | 12.32 | 14.78 | | | | |
| 61 | 9.69 | 12.12 | 14.54 | | | | |
| 62 | 9.54 | 11.92 | 14.31 | | | | |
| 63 | 9.39 | 11.73 | 14.09 | | | | |
| 64 | 9.26 | 11.55 | 13.86 | | | | |
| Const's | 591.33 | 739.16 | 886.99 | Const's | 591.33 | 739.16 | 886.99 |

BAND DRIVE

Twister Twist Gear Table

FRONT ROLL $1\frac{1}{2}$ inch Diameter

Cylinder 8 inches diameter. Ratio Cylinder to Whirl 1 to 5.48

Whirl 1 $\frac{5}{16}$ inch diameter. Front Roll Gear 112 teeth

| Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|-----------------|------------------------|-------------------------|-------------------------|-----------------|------------------------|-------------------------|-------------------------|
| | Twist | Twist | Twist | | Twist | Twist | Twist |
| 21 T | | | 37.21 | 65 T | 8.01 | 10.02 | 12.02 |
| 22 | | | 35.52 | 66 | 7.89 | 9.87 | 11.84 |
| 23 | | | 33.98 | 67 | 7.78 | 9.72 | 11.66 |
| 24 | | 27.13 | 32.56 | 68 | 7.66 | 9.57 | 11.49 |
| 25 | | 26.05 | 31.26 | 69 | 7.55 | 9.44 | 11.33 |
| 26 | | 25.05 | 30.06 | 70 | 7.44 | 9.31 | 11.16 |
| 27 | | 24.12 | 28.95 | 71 | 7.34 | 9.17 | 11.01 |
| 28 | | 23.26 | 27.91 | 72 | 7.24 | 9.04 | 10.85 |
| 29 | | 22.46 | 26.94 | 73 | 7.14 | 8.92 | |
| 30 | | 21.71 | 26.05 | 74 | 7.04 | 8.80 | |
| 31 | | 21.01 | 25.21 | 75 | 6.95 | 8.69 | |
| 32 | | 20.35 | 24.42 | 76 | 6.85 | 8.57 | |
| 33 | | 19.74 | 23.68 | 77 | 6.77 | 8.46 | |
| 34 | | 19.15 | 22.98 | 78 | 6.68 | 8.35 | |
| 35 | | 18.61 | 22.33 | 79 | 6.59 | 8.25 | |
| 36 | | 18.09 | 21.71 | 80 | 6.51 | 8.14 | |
| 37 | | 17.60 | 21.12 | 81 | 6.43 | 8.04 | |
| 38 | | 17.14 | 20.56 | 82 | 6.35 | 7.94 | |
| 39 | | 16.70 | 20.04 | 83 | 6.28 | 7.84 | |
| 40 | | 16.28 | 19.54 | 84 | 6.20 | 7.75 | |
| 41 | | 15.88 | 19.06 | 85 | 6.13 | 7.66 | |
| 42 | | 15.51 | 18.61 | 86 | 6.06 | 7.57 | |
| 43 | | 15.14 | 18.17 | 87 | 5.99 | 7.48 | |
| 44 | | 14.80 | 17.76 | 88 | 5.92 | 7.40 | |
| 45 | 11.58 | 14.47 | 17.37 | 89 | 5.85 | 7.32 | |
| 46 | 11.33 | 14.16 | 16.99 | 90 | 5.79 | 7.23 | |
| 47 | 11.08 | 13.86 | 16.63 | 91 | 5.73 | 7.15 | |
| 48 | 10.85 | 13.57 | 16.28 | 92 | 5.66 | 7.08 | |
| 49 | 10.63 | 13.29 | 15.95 | 93 | 5.60 | 7.00 | |
| 50 | 10.42 | 13.02 | 15.63 | 94 | | 6.93 | |
| 51 | 10.22 | 12.78 | 15.32 | 95 | | 6.86 | |
| 52 | 10.02 | 12.53 | 15.03 | 96 | | 6.78 | |
| 53 | 9.83 | 12.30 | 14.74 | | | | |
| 54 | 9.65 | 12.06 | 14.47 | | | | |
| 55 | 9.47 | 11.85 | 14.21 | | | | |
| 56 | 9.30 | 11.63 | 13.95 | | | | |
| 57 | 9.14 | 11.43 | 13.71 | | | | |
| 58 | 8.98 | 11.23 | 13.47 | | | | |
| 59 | 8.83 | 11.04 | 13.25 | | | | |
| 60 | 8.68 | 10.85 | 13.02 | | | | |
| 61 | 8.54 | 10.68 | 12.81 | | | | |
| 62 | 8.40 | 10.51 | 12.60 | | | | |
| 63 | 8.27 | 10.34 | 12.40 | | | | |
| 64 | 8.14 | 10.17 | 12.21 | | | | |
| Const's | 520.97 | 651.22 | 781.46 | Const's | 520.97 | 651.22 | 781.46 |

BAND DRIVE

Twister Twist Gear Table.

FRONT ROLL $1\frac{1}{2}$ inch Diameter.

Cylinder 8 inch Diameter.

Ratio Cylinder to Whirl 1 to 4.37.

Whirl $1\frac{5}{8}$ inch Diameter.

Front Roll Gear 112 Teeth.

| Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|-----------------|------------------------|-------------------------|-------------------------|-----------------|------------------------|-------------------------|-------------------------|
| | Twist | Twist | Twist | | Twist | Twist | Twist |
| 21T | | | 29.67 | 65T | 6.40 | 7.99 | 9.59 |
| 22 | | | 28.32 | 66 | 6.30 | 7.87 | 9.44 |
| 23 | | | 27.00 | 67 | 6.21 | 7.75 | 9.30 |
| 24 | | 21.64 | 25.96 | 68 | 6.12 | 7.64 | 9.16 |
| 25 | | 20.77 | 24.93 | 69 | 6.02 | 7.53 | 9.03 |
| 26 | | 19.97 | 23.96 | 70 | 5.94 | 7.42 | 8.90 |
| 27 | | 19.23 | 23.08 | 71 | 5.86 | 7.31 | 8.78 |
| 28 | | 18.54 | 22.26 | 72 | 5.78 | 7.21 | 8.66 |
| 29 | | 17.90 | 21.49 | 73 | 5.70 | 7.11 | |
| 30 | | 17.31 | 20.77 | 74 | 5.62 | 7.02 | |
| 31 | | 16.75 | 20.10 | 75 | 5.55 | 6.92 | |
| 32 | | 16.23 | 19.47 | 76 | 5.47 | 6.83 | |
| 33 | | 15.74 | 18.88 | 77 | 5.40 | 6.74 | |
| 34 | | 15.28 | 18.33 | 78 | 5.33 | 6.66 | |
| 35 | | 14.84 | 17.80 | 79 | 5.27 | 6.57 | |
| 36 | | 14.43 | 17.31 | 80 | 5.20 | 6.49 | |
| 37 | | 14.04 | 16.84 | 81 | 5.14 | 6.41 | |
| 38 | | 13.67 | 16.40 | 82 | 5.07 | 6.33 | |
| 39 | | 13.32 | 15.98 | 83 | 5.01 | 6.26 | |
| 40 | | 12.98 | 15.58 | 84 | 4.95 | 6.18 | |
| 41 | | 12.67 | 15.20 | 85 | 4.89 | 6.11 | |
| 42 | | 12.36 | 14.83 | 86 | 4.84 | 6.04 | |
| 43 | | 12.08 | 14.49 | 87 | 4.78 | 5.97 | |
| 44 | | 11.80 | 14.16 | 88 | 4.73 | 5.90 | |
| 45 | 9.25 | 11.54 | 13.85 | 89 | 4.67 | 5.83 | |
| 46 | 9.04 | 11.29 | 13.55 | 90 | 4.62 | 5.77 | |
| 47 | 8.85 | 11.05 | 13.26 | 91 | 4.57 | 5.71 | |
| 48 | 8.67 | 10.82 | 12.98 | 92 | 4.52 | 5.64 | |
| 49 | 8.49 | 10.60 | 12.72 | 93 | 4.47 | 5.58 | |
| 50 | 8.32 | 10.39 | 12.46 | 94 | | 5.52 | |
| 51 | 8.16 | 10.18 | 12.22 | 95 | | 5.47 | |
| 52 | 8.00 | 9.99 | 11.98 | 96 | | 5.41 | |
| 53 | 7.85 | 9.80 | 11.76 | | | | |
| 54 | 7.70 | 9.62 | 11.54 | | | | |
| 55 | 7.56 | 9.44 | 11.33 | | | | |
| 56 | 7.43 | 9.27 | 11.13 | | | | |
| 57 | 7.30 | 9.11 | 10.93 | | | | |
| 58 | 7.17 | 8.95 | 10.74 | | | | |
| 59 | 7.05 | 8.80 | 10.56 | | | | |
| 60 | 6.93 | 8.66 | 10.39 | | | | |
| 61 | 6.82 | 8.51 | 10.22 | | | | |
| 62 | 6.71 | 8.37 | 10.05 | | | | |
| 63 | 6.60 | 8.24 | 9.89 | | | | |
| 64 | 6.50 | 8.11 | 9.74 | | | | |
| Const's | 416.04 | 519.31 | 623.17 | Const's | 416.04 | 519.31 | 623.17 |

BAND DRIVE

Twister Twist Gear Table.

FRONT ROLL $1\frac{1}{2}$ inch Diameter.

Cylinder 8 inch Diameter.

Ratio Cylinder to Whirl 1 to 4.12.

Whirl $1\frac{3}{4}$ inch Diameter.

Front Roll Gear 112 Teeth.

| Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|-----------------|------------------------|-------------------------|-------------------------|-----------------|------------------------|-------------------------|-------------------------|
| | Twist | Twist | Twist | | Twist | Twist | Twist |
| 21 T | | | 27.98 | 65 T | 6.03 | 7.53 | 9.04 |
| 22 | | | 26.71 | 66 | 5.93 | 7.42 | 8.90 |
| 23 | | | 25.54 | 67 | 5.85 | 7.31 | 8.77 |
| 24 | | 20.40 | 24.48 | 68 | 5.76 | 7.20 | 8.64 |
| 25 | | 19.58 | 23.50 | 69 | 5.68 | 7.10 | 8.51 |
| 26 | | 18.83 | 22.60 | 70 | 5.60 | 6.99 | 8.39 |
| 27 | | 18.13 | 21.76 | 71 | 5.52 | 6.90 | 8.27 |
| 28 | | 17.49 | 20.98 | 72 | 5.44 | 6.80 | 8.16 |
| 29 | | 16.88 | 20.26 | 73 | 5.37 | 6.71 | |
| 30 | | 16.32 | 19.58 | 74 | 5.29 | 6.62 | |
| 31 | | 15.79 | 18.95 | 75 | 5.22 | 6.53 | |
| 32 | | 15.30 | 18.36 | 76 | 5.15 | 6.44 | |
| 33 | | 14.84 | 17.80 | 77 | 5.09 | 6.36 | |
| 34 | | 14.40 | 17.28 | 78 | 5.02 | 6.28 | |
| 35 | | 13.99 | 16.79 | 79 | 4.96 | 6.20 | |
| 36 | | 13.60 | 16.32 | 80 | 4.90 | 6.12 | |
| 37 | | 13.23 | 15.88 | 81 | 4.83 | 6.04 | |
| 38 | | 12.88 | 15.46 | 82 | 4.78 | 5.97 | |
| 39 | | 12.55 | 15.06 | 83 | 4.72 | 5.90 | |
| 40 | | 12.24 | 14.69 | 84 | 4.66 | 5.83 | |
| 41 | | 11.94 | 14.33 | 85 | 4.61 | 5.76 | |
| 42 | | 11.66 | 13.99 | 86 | 4.55 | 5.69 | |
| 43 | | 11.39 | 13.66 | 87 | 4.50 | 5.63 | |
| 44 | | 11.12 | 13.35 | 88 | 4.45 | 5.56 | |
| 45 | 8.70 | 10.88 | 13.06 | 89 | 4.40 | 5.50 | |
| 46 | 8.51 | 10.64 | 12.77 | 90 | 4.35 | 5.44 | |
| 47 | 8.33 | 10.42 | 12.50 | 91 | 4.30 | 5.38 | |
| 48 | 8.16 | 10.20 | 12.24 | 92 | 4.26 | 5.32 | |
| 49 | 7.99 | 9.99 | 11.99 | 93 | 4.21 | 5.26 | |
| 50 | 7.83 | 9.79 | 11.75 | 94 | | 5.21 | |
| 51 | 7.68 | 9.60 | 11.52 | 95 | | 5.15 | |
| 52 | 7.53 | 9.42 | 11.30 | 96 | | 5.10 | |
| 53 | 7.39 | 9.24 | 11.09 | | | | |
| 54 | 7.25 | 9.07 | 10.87 | | | | |
| 55 | 7.12 | 8.90 | 10.68 | | | | |
| 56 | 6.99 | 8.74 | 10.49 | | | | |
| 57 | 6.87 | 8.59 | 10.31 | | | | |
| 58 | 6.75 | 8.44 | 10.13 | | | | |
| 59 | 6.64 | 8.30 | 9.96 | | | | |
| 60 | 6.53 | 8.16 | 9.79 | | | | |
| 61 | 6.42 | 8.03 | 9.63 | | | | |
| 62 | 6.32 | 7.90 | 9.48 | | | | |
| 63 | 6.22 | 7.77 | 9.33 | | | | |
| 64 | 6.12 | 7.65 | 9.18 | | | | |
| Const's | 391.68 | 489.60 | 587.52 | Const's | 391.68 | 489.60 | 587.52 |

BAND DRIVE

Twister Twist Gear Table.

FRONT ROLL $1\frac{1}{2}$ inch Diameter

Cylinder 8 inch Diameter. Ratio Cylinder to Whirl 1 to 3.88

Whirl 2 inch Diameter Front Roll Gear 112 Teeth

| Change | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|---------|------------------------|-------------------------|-------------------------|---------|------------------------|-------------------------|-------------------------|
| Gears | Twist | Twist | Twist | Gears | Twist | Twist | Twist |
| 21T | | | 26.35 | 65T | 5.67 | 7.09 | 8.51 |
| 22 | | | 25.15 | 66 | 5.59 | 6.99 | 8.38 |
| 23 | | | 24.06 | 67 | 5.51 | 6.88 | 8.26 |
| 24 | | 19.21 | 23.05 | 68 | 5.42 | 6.78 | 8.14 |
| 25 | | 18.44 | 22.13 | 69 | 5.35 | 6.68 | 8.02 |
| 26 | | 17.73 | 21.28 | 70 | 5.27 | 6.58 | 8.90 |
| 27 | | 17.08 | 20.49 | 71 | 5.19 | 6.49 | 7.79 |
| 28 | | 16.47 | 19.76 | 72 | 5.12 | 6.40 | 7.68 |
| 29 | | 15.90 | 19.08 | 73 | 5.05 | 6.32 | |
| 30 | | 15.37 | 18.44 | 74 | 4.99 | 6.23 | |
| 31 | | 14.87 | 17.85 | 75 | 4.92 | 6.15 | |
| 32 | | 14.40 | 17.29 | 76 | 4.85 | 6.07 | |
| 33 | | 13.97 | 16.77 | 77 | 4.79 | 5.99 | |
| 34 | | 13.56 | 16.27 | 78 | 4.73 | 5.91 | |
| 35 | | 13.17 | 15.81 | 79 | 4.67 | 5.84 | |
| 36 | | 12.81 | 15.37 | 80 | 4.61 | 5.76 | |
| 37 | | 12.46 | 14.95 | 81 | 4.55 | 5.69 | |
| 38 | | 12.13 | 14.56 | 82 | 4.50 | 5.62 | |
| 39 | | 11.82 | 14.19 | 83 | 4.44 | 5.56 | |
| 40 | | 11.53 | 13.83 | 84 | 4.39 | 5.49 | |
| 41 | | 11.25 | 13.50 | 85 | 4.34 | 5.42 | |
| 42 | | 10.98 | 13.17 | 86 | 4.29 | 5.36 | |
| 43 | | 10.72 | 12.87 | 87 | 4.24 | 5.30 | |
| 44 | | 10.48 | 12.58 | 88 | 4.19 | 5.24 | |
| 45 | 8.20 | 10.25 | 12.30 | 89 | 4.14 | 5.18 | |
| 46 | 8.02 | 10.02 | 12.03 | 90 | 4.10 | 5.12 | |
| 47 | 7.85 | 9.81 | 11.77 | 91 | 4.05 | 5.07 | |
| 48 | 7.69 | 9.61 | 11.53 | 92 | 4.01 | 5.01 | |
| 49 | 7.53 | 9.41 | 11.29 | 93 | 3.97 | 4.96 | |
| 50 | 7.38 | 9.22 | 11.07 | 94 | | 4.91 | |
| 51 | 7.23 | 9.04 | 10.85 | 95 | | 4.85 | |
| 52 | 7.09 | 8.87 | 10.64 | 96 | | 4.80 | |
| 53 | 6.96 | 8.70 | 10.44 | | | | |
| 54 | 6.83 | 8.54 | 10.25 | | | | |
| 55 | 6.71 | 8.38 | 10.06 | | | | |
| 56 | 6.59 | 8.23 | 9.88 | | | | |
| 57 | 6.47 | 8.08 | 9.71 | | | | |
| 58 | 6.36 | 7.95 | 9.54 | | | | |
| 59 | 6.25 | 7.81 | 9.38 | | | | |
| 60 | 6.15 | 7.68 | 9.22 | | | | |
| 61 | 6.05 | 7.56 | 9.07 | | | | |
| 62 | 5.95 | 7.44 | 8.92 | | | | |
| 63 | 5.86 | 7.32 | 8.78 | | | | |
| 64 | 5.76 | 7.20 | 8.65 | | | | |
| Const's | 368.87 | 461.08 | 553.30 | Const's | 368.87 | 461.08 | 553.30 |

BAND DRIVE

Twister Twist Gear Table.

FRONT ROLL $1\frac{1}{2}$ inch Diameter.

Cylinder 8 inch Diameter.

Ratio Cylinder to Whirl 1 to 3.03.

Whirl $2\frac{1}{2}$ inch Diameter.

Front Roll Gear 112 Teeth.

| Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T | Change Gears | Cyl. 20 T Stud 80 T | Cyl. 20 T Stud 100 T | Cyl. 20 T Stud 120 T |
|-----------------|------------------------|-------------------------|-------------------------|-----------------|------------------------|-------------------------|-------------------------|
| | Twist | Twist | Twist | | Twist | Twist | Twist |
| 21T | | | 20.58 | 65T | 4.43 | 5.54 | 6.65 |
| 22 | | | 19.64 | 66 | 4.36 | 5.46 | 6.55 |
| 23 | | | 18.79 | 67 | 4.30 | 5.37 | 6.45 |
| 24 | | 15.00 | 18.00 | 68 | 4.24 | 5.30 | 6.35 |
| 25 | | 14.40 | 17.28 | 69 | 4.17 | 5.22 | 6.26 |
| 26 | | 13.85 | 16.62 | 70 | 4.12 | 5.14 | 6.17 |
| 27 | | 13.34 | 16.00 | 71 | 4.06 | 5.07 | 6.09 |
| 28 | | 12.86 | 15.43 | 72 | 4.00 | 5.00 | 6.00 |
| 29 | | 12.41 | 14.90 | 73 | 3.95 | 4.93 | |
| 30 | | 12.00 | 14.40 | 74 | 3.89 | 4.87 | |
| 31 | | 11.62 | 13.94 | 75 | 3.84 | 4.80 | |
| 32 | | 11.25 | 13.50 | 76 | 3.79 | 4.74 | |
| 33 | | 10.91 | 13.09 | 77 | 3.74 | 4.68 | |
| 34 | | 10.59 | 12.71 | 78 | 3.69 | 4.62 | |
| 35 | | 10.29 | 12.34 | 79 | 3.65 | 4.56 | |
| 36 | | 10.00 | 12.00 | 80 | 3.60 | 4.50 | |
| 37 | | 9.73 | 11.68 | 81 | 3.56 | 4.45 | |
| 38 | | 9.48 | 11.37 | 82 | 3.51 | 4.39 | |
| 39 | | 9.23 | 11.08 | 83 | 3.47 | 4.34 | |
| 40 | | 9.00 | 10.80 | 84 | 3.43 | 4.29 | |
| 41 | | 8.78 | 10.54 | 85 | 3.39 | 4.24 | |
| 42 | | 8.57 | 10.29 | 86 | 3.35 | 4.19 | |
| 43 | | 8.37 | 10.05 | 87 | 3.31 | 4.13 | |
| 44 | | 8.18 | 9.82 | 88 | 3.27 | 4.09 | |
| 45 | 6.40 | 8.00 | 9.60 | 89 | 3.24 | 4.05 | |
| 46 | 6.26 | 7.83 | 9.39 | 90 | 3.20 | 4.00 | |
| 47 | 6.13 | 7.66 | 9.19 | 91 | 3.17 | 3.96 | |
| 48 | 6.00 | 7.50 | 9.00 | 92 | 3.13 | 3.91 | |
| 49 | 5.88 | 7.35 | 8.82 | 93 | 3.10 | 3.87 | |
| 50 | 5.76 | 7.20 | 8.64 | 94 | | 3.83 | |
| 51 | 5.65 | 7.06 | 8.47 | 95 | | 3.79 | |
| 52 | 5.54 | 6.92 | 8.31 | 96 | | 3.75 | |
| 53 | 5.44 | 6.79 | 8.15 | | | | |
| 54 | 5.33 | 6.67 | 8.00 | | | | |
| 55 | 5.24 | 6.54 | 7.86 | | | | |
| 56 | 5.14 | 6.43 | 7.72 | | | | |
| 57 | 5.05 | 6.32 | 7.58 | | | | |
| 58 | 4.97 | 6.21 | 7.45 | | | | |
| 59 | 4.88 | 6.10 | 7.32 | | | | |
| 60 | 4.80 | 6.00 | 7.20 | | | | |
| 61 | 4.72 | 5.90 | 7.08 | | | | |
| 62 | 4.65 | 5.81 | 6.97 | | | | |
| 63 | 4.57 | 5.72 | 6.86 | | | | |
| 64 | 4.50 | 5.63 | 6.75 | | | | |
| Const's | 288.06 | 360.07 | 432.09 | Const's | 288.06 | 360.07 | 432.09 |

BAND DRIVE

Twister Change Twist Gear Tables.

Cylinder 7 in. Diameter. Whirl $\frac{7}{8}$ in. Diameter.
Speed Ratio of Cylinder to Whirl 1 to 7.25.

| Change Gear. | Cyl. 22T. Stud 88T. | | Cyl. 36T. Stud 74T. | | Cyl. 55T. Stud 55T. | |
|--------------|--|--|--|--|--|--|
| | 1 $\frac{3}{8}$ in. Roll 108T. Gear | 1 $\frac{1}{2}$ in. Roll 112T. Gear | 1 $\frac{3}{8}$ in. Roll 108T. Gear | 1 $\frac{1}{2}$ in. Roll 112T. Gear | 1 $\frac{3}{8}$ in. Roll 108T. Gear | 1 $\frac{1}{2}$ in. Roll 112T. Gear |
| | Twist. | Twist. | Twist. | Twist. | Twist. | Twist. |
| 15 | 48.32 | 45.93 | 24.83 | 23.60 | 12.08 | 11.48 |
| 16 | 45.30 | 43.06 | 23.28 | 22.14 | 11.02 | 10.76 |
| 17 | 42.63 | 40.53 | 21.91 | 20.83 | 10.66 | 10.13 |
| 18 | 40.27 | 38.28 | 20.69 | 19.67 | 10.07 | 9.57 |
| 19 | 38.15 | 36.26 | 19.60 | 18.63 | 9.54 | 9.06 |
| 20 | 36.24 | 34.44 | 18.62 | 17.70 | 9.06 | 8.61 |
| 21 | 34.51 | 32.81 | 17.74 | 16.86 | 8.63 | 8.20 |
| 22 | 32.95 | 31.32 | 16.93 | 16.08 | 8.24 | 7.83 |
| 23 | 31.51 | 29.96 | 16.19 | 15.35 | 7.88 | 7.49 |
| 24 | 30.20 | 28.71 | 15.52 | 14.75 | 7.55 | 7.18 |
| 25 | 28.99 | 27.56 | 14.90 | 14.16 | 7.25 | 6.89 |
| 26 | 27.88 | 26.50 | 14.33 | 13.62 | 6.97 | 6.62 |
| 27 | 26.84 | 25.52 | 13.79 | 13.11 | 6.71 | 6.38 |
| 28 | 25.89 | 24.61 | 13.30 | 12.66 | 6.47 | 6.15 |
| 29 | 24.99 | 23.75 | 12.84 | 12.21 | 6.25 | 5.94 |
| 30 | 24.16 | 22.96 | 12.41 | 11.80 | 6.04 | 5.74 |
| 31 | 23.38 | 22.22 | 12.01 | 11.42 | 5.84 | 5.55 |
| 32 | 22.65 | 21.53 | 11.64 | 11.06 | 5.66 | 5.38 |
| 33 | 21.96 | 20.88 | 11.28 | 10.73 | 5.49 | 5.22 |
| 34 | 21.32 | 20.26 | 10.95 | 10.41 | 5.33 | 5.06 |
| 35 | 20.71 | 19.68 | 10.64 | 10.11 | 5.18 | 4.92 |
| 36 | 20.13 | 19.13 | 10.34 | 9.84 | 5.03 | 4.78 |
| 37 | 19.59 | 18.62 | 10.06 | 9.57 | 4.90 | 4.65 |
| 38 | 19.07 | 18.13 | 9.80 | 9.32 | 4.77 | 4.53 |
| 39 | 18.58 | 17.69 | 9.55 | 9.08 | 4.64 | 4.42 |
| 40 | 18.12 | 17.22 | 9.31 | 8.85 | 4.53 | 4.30 |
| 41 | 17.68 | 16.80 | 9.08 | 8.63 | 4.42 | 4.20 |
| 42 | 17.26 | 16.40 | 8.87 | 8.43 | 4.31 | 4.10 |
| 43 | 16.85 | 16.02 | 8.66 | 8.23 | 4.21 | 4.00 |
| 44 | 16.47 | 15.66 | 8.46 | 8.04 | 4.12 | 3.91 |
| 45 | 16.11 | 15.33 | 8.27 | 7.86 | 4.03 | 3.83 |
| 46 | 15.76 | 14.98 | 8.09 | 7.69 | 3.94 | 3.74 |
| 47 | 15.42 | 14.66 | 7.92 | 7.53 | 3.85 | 3.66 |
| 48 | 15.10 | 14.35 | 7.76 | 7.37 | 3.77 | 3.59 |
| 49 | 14.79 | 14.06 | 7.60 | 7.22 | 3.70 | 3.51 |
| 50 | 14.49 | 13.78 | 7.45 | 7.08 | 3.62 | 3.44 |
| 51 | 14.21 | 13.51 | 7.30 | 6.94 | 3.55 | 3.38 |
| 52 | 13.94 | 13.25 | 7.16 | 6.81 | 3.48 | 3.31 |
| 53 | 13.67 | 13.00 | 7.03 | 6.68 | 3.42 | 3.25 |
| 54 | 13.42 | 12.76 | 6.90 | 6.55 | 3.35 | 3.19 |
| 55 | 13.18 | 12.54 | 6.77 | 6.44 | 3.29 | 3.13 |
| 56 | 12.94 | 12.30 | 6.65 | 6.32 | 3.23 | 3.07 |
| 57 | 12.72 | 12.10 | 6.53 | 6.21 | 3.18 | 3.02 |
| 58 | 12.50 | 11.88 | 6.42 | 6.10 | 3.12 | 2.97 |
| 59 | 12.28 | 11.69 | 6.31 | 6.00 | 3.07 | 2.92 |
| 60 | 12.08 | 11.48 | 6.21 | 5.90 | 3.02 | 2.87 |

BAND DRIVE

Twister Change Twist Gear Tables.

Cylinder 7 in. Diameter. Whirl $1\frac{5}{16}$ in. Diameter.
Speed Ratio of Cylinder to Whirl 1 to 4.80.

| Change Gear. | Cyl. 22T. | Stud 88T. | Cyl. 36T. | Stud 74T. | Cyl. 55T. | Stud 55T. |
|--------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| | $1\frac{1}{8}$ in. Roll 108T. Gear | $1\frac{1}{2}$ in. Roll 112T. Gear | $1\frac{1}{8}$ in. Roll 108T. Gear | $1\frac{1}{2}$ in. Roll 112T. Gear | $1\frac{1}{8}$ in. Roll 108T. Gear | $1\frac{1}{2}$ in. Roll 112T. Gear |
| | Twist. | Twist. | Twist. | Twist. | Twist. | Twist. |
| 15 | 32.00 | 30.41 | 16.44 | 15.63 | 8.00 | 7.60 |
| 16 | 30.00 | 28.51 | 15.41 | 14.65 | 7.50 | 7.13 |
| 17 | 28.23 | 26.83 | 14.50 | 13.79 | 7.06 | 6.71 |
| 18 | 26.66 | 25.34 | 13.70 | 13.02 | 6.67 | 6.33 |
| 19 | 25.26 | 24.01 | 12.98 | 12.34 | 6.32 | 6.00 |
| 20 | 24.00 | 22.80 | 12.33 | 11.72 | 6.00 | 5.70 |
| 21 | 22.85 | 21.72 | 11.74 | 11.16 | 5.71 | 5.43 |
| 22 | 21.81 | 20.73 | 11.21 | 10.66 | 5.45 | 5.18 |
| 23 | 20.86 | 19.83 | 10.72 | 10.19 | 5.22 | 4.96 |
| 24 | 20.00 | 19.01 | 10.28 | 9.77 | 5.00 | 4.75 |
| 25 | 19.20 | 18.24 | 9.86 | 9.38 | 4.80 | 4.56 |
| 26 | 18.46 | 17.54 | 9.49 | 9.02 | 4.61 | 4.38 |
| 27 | 17.77 | 16.89 | 9.13 | 8.68 | 4.44 | 4.22 |
| 28 | 17.14 | 16.29 | 8.81 | 8.37 | 4.29 | 4.07 |
| 29 | 16.55 | 15.73 | 8.50 | 8.08 | 4.14 | 3.93 |
| 30 | 16.00 | 15.20 | 8.22 | 7.81 | 4.00 | 3.80 |
| 31 | 15.48 | 14.71 | 7.96 | 7.56 | 3.87 | 3.68 |
| 32 | 15.00 | 14.27 | 7.70 | 7.33 | 3.75 | 3.57 |
| 33 | 14.54 | 13.82 | 7.47 | 7.10 | 3.64 | 3.45 |
| 34 | 14.11 | 13.41 | 7.25 | 6.89 | 3.53 | 3.35 |
| 35 | 13.71 | 13.03 | 7.05 | 6.70 | 3.43 | 3.26 |
| 36 | 13.33 | 12.67 | 6.85 | 6.51 | 3.33 | 3.17 |
| 37 | 12.97 | 12.33 | 6.67 | 6.33 | 3.24 | 3.08 |
| 38 | 12.63 | 12.00 | 6.49 | 6.17 | 3.16 | 3.00 |
| 39 | 12.30 | 11.68 | 6.32 | 6.01 | 3.08 | 2.92 |
| 40 | 12.00 | 11.40 | 6.16 | 5.86 | 3.00 | 2.85 |
| 41 | 11.70 | 11.13 | 6.01 | 5.72 | 2.93 | 2.78 |
| 42 | 11.42 | 10.87 | 5.87 | 5.58 | 2.86 | 2.72 |
| 43 | 11.16 | 10.61 | 5.73 | 5.45 | 2.79 | 2.65 |
| 44 | 10.90 | 10.34 | 5.60 | 5.33 | 2.73 | 2.58 |
| 45 | 10.66 | 10.13 | 5.48 | 5.21 | 2.67 | 2.53 |
| 46 | 10.43 | 9.92 | 5.36 | 5.09 | 2.61 | 2.48 |
| 47 | 10.21 | 9.71 | 5.25 | 4.99 | 2.55 | 2.43 |
| 48 | 10.00 | 9.50 | 5.14 | 4.88 | 2.50 | 2.37 |
| 49 | 9.79 | 9.31 | 5.03 | 4.78 | 2.45 | 2.33 |
| 50 | 9.60 | 9.12 | 4.93 | 4.69 | 2.40 | 2.28 |
| 51 | 9.41 | 8.95 | 4.83 | 4.60 | 2.35 | 2.24 |
| 52 | 9.23 | 8.77 | 4.74 | 4.51 | 2.31 | 2.19 |
| 53 | 9.05 | 8.61 | 4.65 | 4.43 | 2.26 | 2.15 |
| 54 | 8.88 | 8.45 | 4.57 | 4.34 | 2.22 | 2.11 |
| 55 | 8.72 | 8.30 | 4.48 | 4.27 | 2.18 | 2.08 |
| 56 | 8.57 | 8.14 | 4.40 | 4.19 | 2.14 | 2.03 |
| 57 | 8.42 | 8.01 | 4.33 | 4.12 | 2.11 | 2.00 |
| 58 | 8.27 | 7.86 | 4.25 | 4.04 | 2.07 | 1.96 |
| 59 | 8.13 | 7.74 | 4.18 | 3.98 | 2.03 | 1.93 |
| 60 | 8.00 | 7.60 | 4.11 | 3.91 | 2.00 | 1.90 |

BAND DRIVE

Twister Change Twist Gear Tables.

Cylinder 8 in. Diameter. Whirl $\frac{7}{8}$ in. Diameter.
Speed Ratio of Cylinder to Whirl 1 to 8.28.

| Change Gear. | Cyl. 22T. | Stud 88T. | Cyl. 36T. | Stud 74T. | Cyl. 55T. | Stud 55T. |
|--------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| | $1\frac{3}{4}$ in. Roll 108T.Gear | $1\frac{1}{2}$ in. Roll 112T.Gear | $1\frac{3}{4}$ in. Roll 108T.Gear | $1\frac{1}{2}$ in. Roll 112T.Gear | $1\frac{3}{4}$ in. Roll 108T.Gear | $1\frac{1}{2}$ in. Roll 112T.Gear |
| | Twist. | Twist. | Twist. | Twist. | Twist. | Twist. |
| 15 | 55.18 | 52.46 | 28.36 | 26.96 | 13.79 | 13.11 |
| 16 | 51.73 | 49.18 | 26.58 | 25.27 | 12.93 | 12.29 |
| 17 | 48.70 | 46.28 | 25.02 | 23.78 | 12.17 | 11.57 |
| 18 | 45.98 | 43.71 | 23.63 | 22.46 | 11.49 | 10.93 |
| 19 | 43.56 | 41.41 | 22.38 | 21.28 | 10.89 | 10.35 |
| 20 | 41.38 | 39.34 | 21.27 | 20.21 | 10.34 | 9.83 |
| 21 | 39.41 | 37.47 | 20.25 | 19.25 | 9.85 | 9.37 |
| 22 | 37.62 | 35.77 | 19.34 | 18.38 | 9.41 | 8.94 |
| 23 | 35.99 | 34.21 | 18.49 | 17.58 | 9.00 | 8.55 |
| 24 | 34.49 | 32.78 | 17.72 | 16.85 | 8.62 | 8.19 |
| 25 | 33.11 | 31.47 | 17.01 | 16.17 | 8.28 | 7.87 |
| 26 | 31.84 | 30.26 | 16.36 | 15.55 | 7.96 | 7.56 |
| 27 | 30.66 | 29.14 | 15.75 | 14.98 | 7.66 | 7.28 |
| 28 | 29.56 | 28.10 | 15.19 | 14.44 | 7.39 | 7.02 |
| 29 | 28.54 | 27.13 | 14.67 | 13.94 | 7.13 | 6.78 |
| 30 | 27.59 | 26.23 | 14.18 | 13.47 | 6.90 | 6.56 |
| 31 | 26.70 | 25.38 | 13.72 | 13.04 | 6.68 | 6.34 |
| 32 | 25.87 | 24.59 | 13.29 | 12.64 | 6.47 | 6.15 |
| 33 | 25.08 | 23.84 | 12.89 | 12.25 | 6.27 | 5.96 |
| 34 | 24.34 | 23.14 | 12.51 | 11.89 | 6.08 | 5.78 |
| 35 | 23.65 | 22.48 | 12.15 | 11.55 | 5.91 | 5.62 |
| 36 | 22.99 | 21.86 | 11.81 | 11.23 | 5.75 | 5.46 |
| 37 | 22.37 | 21.26 | 11.49 | 10.93 | 5.59 | 5.31 |
| 38 | 21.78 | 20.71 | 11.19 | 10.64 | 5.44 | 5.18 |
| 39 | 21.22 | 20.17 | 10.91 | 10.36 | 5.30 | 5.04 |
| 40 | 20.69 | 19.67 | 10.63 | 10.11 | 5.17 | 4.92 |
| 41 | 20.19 | 19.19 | 10.37 | 9.86 | 5.05 | 4.80 |
| 42 | 19.71 | 18.73 | 10.12 | 9.63 | 4.93 | 4.68 |
| 43 | 19.25 | 18.34 | 9.89 | 9.40 | 4.81 | 4.58 |
| 44 | 18.81 | 17.88 | 9.67 | 9.19 | 4.70 | 4.47 |
| 45 | 18.39 | 17.48 | 9.45 | 8.98 | 4.60 | 4.37 |
| 46 | 17.99 | 17.11 | 9.25 | 8.79 | 4.50 | 4.28 |
| 47 | 17.61 | 16.74 | 9.05 | 8.60 | 4.40 | 4.18 |
| 48 | 17.24 | 16.39 | 8.86 | 8.42 | 4.31 | 4.10 |
| 49 | 16.89 | 16.06 | 8.68 | 8.25 | 4.22 | 4.01 |
| 50 | 16.55 | 15.73 | 8.51 | 8.09 | 4.14 | 3.93 |
| 51 | 16.23 | 15.44 | 8.34 | 7.93 | 4.06 | 3.86 |
| 52 | 15.92 | 15.13 | 8.18 | 7.77 | 3.98 | 3.78 |
| 53 | 15.62 | 14.86 | 8.02 | 7.64 | 3.90 | 3.71 |
| 54 | 15.31 | 14.57 | 7.88 | 7.49 | 3.83 | 3.64 |
| 55 | 15.05 | 14.32 | 7.73 | 7.36 | 3.76 | 3.58 |
| 56 | 14.78 | 14.05 | 7.59 | 7.22 | 3.69 | 3.51 |
| 57 | 14.52 | 13.82 | 7.46 | 7.10 | 3.63 | 3.45 |
| 58 | 14.27 | 13.56 | 7.33 | 6.97 | 3.57 | 3.39 |
| 59 | 14.03 | 13.35 | 7.21 | 6.86 | 3.51 | 3.34 |
| 60 | 13.80 | 13.11 | 7.09 | 6.74 | 3.45 | 3.28 |

BAND DRIVE

Twister Change Twist Gear Tables.

Cylinder 8 in. Diameter. Whirl $1\frac{5}{16}$ in. Diameter.
Speed Ratio of Cylinder to Whirl 1 to 5.48.

| Change Gear. | Cyl. 22T. | Stud 88T. | Cyl. 36T. | Stud 74T. | Cyl. 55T. | Stud 55T. |
|-----------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| | $1\frac{1}{8}$ in. Roll 108T.Gear | $1\frac{1}{2}$ in. Roll 112T.Gear | $1\frac{1}{8}$ in. Roll 108T.Gear | $1\frac{1}{2}$ in. Roll 112T.Gear | $1\frac{1}{8}$ in. Roll 108T.Gear | $1\frac{1}{2}$ in. Roll 112T.Gear |
| | Twist. | Twist. | Twist. | Twist. | Twist. | Twist. |
| 15 | 36.53 | 34.72 | 18.77 | 17.84 | 9.13 | 8.68 |
| 16 | 34.25 | 32.55 | 17.60 | 16.73 | 8.56 | 8.14 |
| 17 | 32.23 | 30.63 | 16.56 | 15.74 | 8.06 | 7.66 |
| 18 | 30.44 | 28.93 | 15.64 | 14.86 | 7.61 | 7.24 |
| 19 | 28.84 | 27.41 | 14.82 | 14.08 | 7.21 | 6.85 |
| 20 | 27.40 | 26.04 | 14.08 | 13.38 | 6.85 | 6.51 |
| 21 | 26.09 | 24.79 | 13.41 | 12.74 | 6.52 | 6.20 |
| 22 | 24.90 | 23.67 | 12.80 | 12.16 | 6.22 | 5.92 |
| 23 | 23.82 | 22.64 | 12.24 | 11.64 | 5.95 | 5.66 |
| 24 | 22.83 | 21.69 | 11.73 | 11.15 | 5.71 | 5.42 |
| 25 | 21.92 | 20.83 | 11.26 | 10.71 | 5.48 | 5.21 |
| 26 | 21.07 | 20.03 | 10.83 | 10.29 | 5.27 | 5.01 |
| 27 | 20.29 | 19.29 | 10.43 | 9.91 | 5.06 | 4.82 |
| 28 | 19.57 | 18.60 | 10.06 | 9.56 | 4.89 | 4.65 |
| 29 | 18.89 | 17.95 | 9.71 | 9.21 | 4.72 | 4.49 |
| 30 | 18.26 | 17.35 | 9.38 | 8.92 | 4.56 | 4.34 |
| 31 | 17.67 | 16.80 | 9.08 | 8.63 | 4.42 | 4.20 |
| 32 | 17.12 | 16.28 | 8.80 | 8.36 | 4.28 | 4.07 |
| 33 | 16.60 | 15.78 | 8.53 | 8.11 | 4.15 | 3.94 |
| 34 | 16.11 | 15.31 | 8.28 | 7.86 | 4.03 | 3.83 |
| 35 | 15.65 | 14.88 | 8.04 | 7.65 | 3.91 | 3.72 |
| 36 | 15.22 | 14.46 | 7.82 | 7.43 | 3.80 | 3.61 |
| 37 | 14.81 | 14.07 | 7.61 | 7.23 | 3.70 | 3.52 |
| 38 | 14.42 | 13.70 | 7.41 | 7.04 | 3.60 | 3.42 |
| 39 | 14.05 | 13.35 | 7.22 | 6.86 | 3.51 | 3.34 |
| 40 | 13.70 | 13.02 | 7.04 | 6.69 | 3.42 | 3.25 |
| 41 | 13.36 | 12.70 | 6.87 | 6.53 | 3.34 | 3.17 |
| 42 | 13.04 | 12.40 | 6.70 | 6.37 | 3.26 | 3.10 |
| 43 | 12.74 | 12.11 | 6.55 | 6.22 | 3.18 | 3.03 |
| 44 | 12.45 | 11.83 | 6.40 | 6.08 | 3.11 | 2.96 |
| 45 | 12.17 | 11.57 | 6.25 | 5.95 | 3.04 | 2.89 |
| 46 | 11.91 | 11.32 | 6.12 | 5.82 | 2.98 | 2.83 |
| 47 | 11.65 | 11.08 | 5.99 | 5.69 | 2.91 | 2.77 |
| 48 | 11.41 | 10.85 | 5.86 | 5.57 | 2.85 | 2.71 |
| 49 | 11.18 | 10.63 | 5.74 | 5.46 | 2.79 | 2.66 |
| 50 | 10.96 | 10.41 | 5.63 | 5.35 | 2.74 | 2.60 |
| 51 | 10.74 | 10.22 | 5.52 | 5.25 | 2.68 | 2.56 |
| 52 | 10.53 | 10.01 | 5.41 | 5.15 | 2.63 | 2.50 |
| 53 | 10.34 | 9.83 | 5.31 | 5.05 | 2.58 | 2.46 |
| 54 | 10.14 | 9.65 | 5.21 | 4.96 | 2.53 | 2.41 |
| 55 | 9.96 | 9.48 | 5.12 | 4.87 | 2.49 | 2.37 |
| 56 | 9.78 | 9.30 | 5.03 | 4.78 | 2.44 | 2.32 |
| 57 | 9.61 | 9.14 | 4.94 | 4.70 | 2.40 | 2.29 |
| 58 | 9.44 | 8.98 | 4.85 | 4.62 | 2.36 | 2.24 |
| 59 | 9.28 | 8.83 | 4.77 | 4.54 | 2.32 | 2.21 |
| 60 | 9.13 | 8.66 | 4.69 | 4.46 | 2.28 | 2.16 |

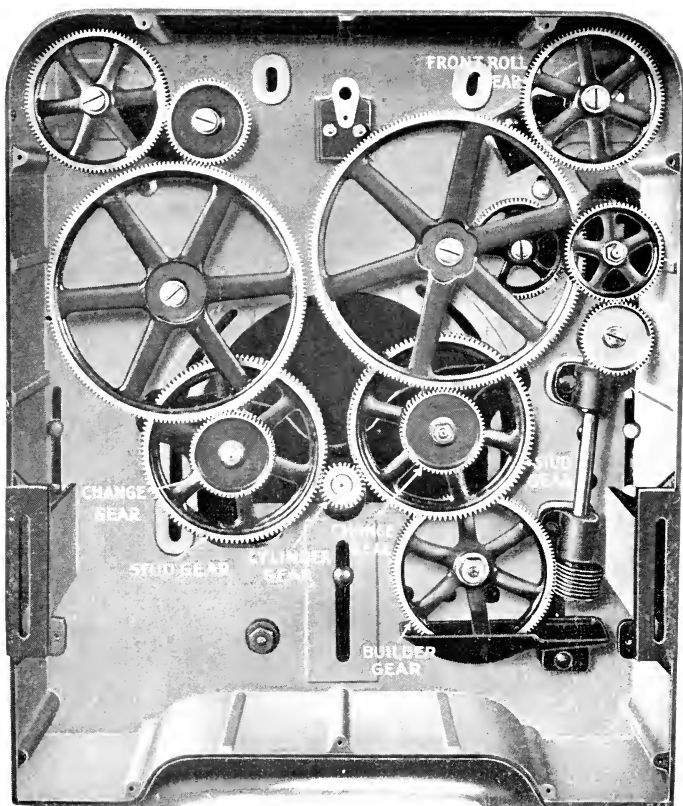
BAND DRIVE

Twister Change Twist Gear Table.

Whirl 2 inches diameter.

Front Roll $1\frac{1}{2}$ inch diameter. Front Roll Gear 112 teeth.

| Change Gear | Cylinder 7 in. diam. Cyl. : Whirl :: 1 : 3.41. | | | Cylinder 8 in. diam. Cyl. : Whirl :: 1 : 3.88 | | |
|----------------|---|------------------------|-------------------------|--|------------------------|------------------------|
| | Cyl. 22T. Stud 88T. | Cyl. 36T. Stud 74T. | Cyl. 55T. Stud. 55T. | Cyl. 22T. Stud 88T. | Cyl. 36T. Stud 74T. | Cyl. 55T. Stud 55T. |
| | Twist. | Twist. | Twist. | Twist. | Twist. | Twist |
| | | | | | | |
| 20T | 16.20 | 8.32 | 4.05 | 18.43 | 9.47 | 4.61 |
| 21 | 15.43 | 7.93 | 3.86 | 17.56 | 9.02 | 4.39 |
| 22 | 14.73 | 7.57 | 3.68 | 16.76 | 8.61 | 4.19 |
| 23 | 14.09 | 7.24 | 3.52 | 16.03 | 8.24 | 4.01 |
| 24 | 13.50 | 6.94 | 3.38 | 15.37 | 7.90 | 3.84 |
| 25 | 12.96 | 6.66 | 3.24 | 14.75 | 7.58 | 3.69 |
| 26 | 12.46 | 6.41 | 3.12 | 14.18 | 7.29 | 3.55 |
| 27 | 12.00 | 6.17 | 3.00 | 13.66 | 7.02 | 3.41 |
| 28 | 11.57 | 5.95 | 2.89 | 13.17 | 6.77 | 3.29 |
| 29 | 11.17 | 5.74 | 2.79 | 12.71 | 6.53 | 3.18 |
| 30 | 10.80 | 5.55 | 2.70 | 12.29 | 6.32 | 3.07 |
| 31 | 10.45 | 5.37 | 2.61 | 11.89 | 6.11 | 2.97 |
| 32 | 10.12 | 5.20 | 2.53 | 11.52 | 5.92 | 2.88 |
| 33 | 9.82 | 5.05 | 2.45 | 11.17 | 5.74 | 2.79 |
| 34 | 9.53 | 4.90 | 2.38 | 10.84 | 5.57 | 2.71 |
| 35 | 9.26 | 4.76 | 2.31 | 10.53 | 5.41 | 2.63 |
| 36 | 9.00 | 4.63 | 2.25 | 10.24 | 5.26 | 2.56 |
| 37 | 8.76 | 4.50 | 2.19 | 9.97 | 5.12 | 2.49 |
| 38 | 8.53 | 4.38 | 2.13 | 9.70 | 4.99 | 2.43 |
| 39 | 8.31 | 4.27 | 2.08 | 9.45 | 4.86 | 2.36 |
| 40 | 8.10 | 4.16 | 2.03 | 9.22 | 4.74 | 2.30 |
| 41 | 7.90 | 4.06 | 1.98 | 8.99 | 4.62 | 2.25 |
| 42 | 7.72 | 3.96 | 1.93 | 8.78 | 4.51 | 2.19 |
| 43 | 7.54 | 3.87 | 1.89 | 8.57 | 4.41 | 2.14 |
| 44 | 7.36 | 3.78 | 1.84 | 8.38 | 4.31 | 2.10 |
| 45 | 7.20 | 3.70 | 1.80 | 8.19 | 4.21 | 2.05 |
| 46 | 7.04 | 3.62 | 1.78 | 8.02 | 4.12 | 2.00 |
| 48 | 6.75 | 3.47 | 1.69 | 7.68 | 3.95 | 1.92 |
| 50 | 6.48 | 3.33 | 1.62 | 7.37 | 3.79 | 1.84 |
| 52 | 6.23 | 3.20 | 1.56 | 7.09 | 3.64 | 1.77 |
| 54 | 6.00 | 3.08 | 1.50 | 6.83 | 3.61 | 1.71 |
| 56 | 5.79 | 2.97 | 1.45 | 6.58 | 3.38 | 1.65 |
| 58 | 5.59 | 2.87 | 1.40 | 6.36 | 3.27 | 1.59 |
| 60 | 5.40 | 2.78 | 1.35 | 6.15 | 3.16 | 1.54 |
| 64 | 5.06 | 2.60 | 1.27 | 5.76 | 2.96 | 1.44 |
| 68 | 4.77 | 2.45 | 1.19 | 5.42 | 2.79 | 1.36 |
| 72 | 4.50 | 2.31 | 1.13 | 5.12 | 2.63 | 1.28 |
| 76 | 4.26 | 2.19 | 1.07 | 4.85 | 2.49 | 1.21 |
| 80 | 4.05 | 2.08 | 1.01 | 4.61 | 2.37 | 1.15 |
| 84 | 3.86 | 1.98 | .96 | 4.39 | 2.26 | 1.10 |
| 88 | 3.68 | 1.89 | .92 | 4.19 | 2.15 | 1.05 |



Tape Drive Twisting Frame Twist Gearing

Formula for figuring twist:

C = Cylinder Gear.

S = Stud Gear.

T = Change Gear

$$\frac{F \times S \times R}{C \times T \times D} = \text{Twist per inch.}$$

$$\frac{\text{Twist Constant}}{\text{Change Gear}} = \text{Twist per inch.}$$

F = Front Roll Gear.

R = Ratio Whirl to Cylinder.

D = Circumference of Front Roll.

$$\frac{F \times S \times R}{C \times D} = \text{Twist Constant.}$$

$$\frac{\text{Twist Constant}}{\text{Twist per inch.}} = \text{Change Gear.}$$

TAPE DRIVE

TWIST GEARING CONSTANTS FOR WHITIN TWISTER FRAME

| 8 Inch Cylinder | | | | | | | | | |
|------------------------|-------------------------|-----------|------------|-----------|-------------------------|------------|-----------|------------|-----------|
| 7 Inch Cylinder | | | | | Front Roll 1½ inch Dia. | | | | |
| Front Roll 1½ in. Dia. | | | | | Front Roll Gear 100 T | | | | |
| Diameter of Whirl | Ratio Whirl to Cylinder | Cyl. 20 T | | Cyl. 26 T | Cyl. 132 T | | Cyl. 26 T | Cyl. 112 T | |
| | | Const's | Stud 138 T | | Const's | Stud 132 T | | Const's | Stud 92 T |
| 1 in. | 7.80 | 1142.09 | 840.34 | 713.00 | 585.08 | 331.05 | 8.80 | 1288.51 | 948.07 |
| 1 1/16 in. | 7.27 | 1064.49 | 783.23 | 664.56 | 545.89 | 308.54 | 8.30 | 1186.02 | 872.65 |
| 1 1/8 in. | 6.81 | 997.13 | 733.67 | 622.51 | 511.35 | 289.02 | 7.80 | 1127.45 | 829.56 |
| 1 1/4 in. | 6.43 | 941.49 | 692.73 | 587.77 | 482.81 | 272.90 | 7.30 | 1068.88 | 786.45 |
| 1 3/8 in. | 6.09 | 891.71 | 656.10 | 556.69 | 457.33 | 258.46 | 6.80 | 1024.95 | 754.14 |
| 1 1/2 in. | 5.82 | 854.32 | 623.38 | 527.16 | 431.96 | 241.54 | 6.30 | 983.89 | 725.61 |
| 1 5/8 in. | 5.22 | 764.32 | 562.38 | 477.16 | 391.96 | 221.54 | 5.90 | 948.07 | 693.64 |
| 1 3/4 in. | 4.20 | 614.97 | 452.48 | 383.92 | 315.37 | 178.25 | 4.84 | 908.67 | 653.64 |
| 1 7/8 in. | 3.93 | 575.44 | 423.31 | 359.24 | 295.10 | 166.78 | 4.52 | 872.65 | 625.61 |
| 2 in. | 3.51 | 513.94 | 378.15 | 320.86 | 263.56 | 148.96 | 4.00 | 840.34 | 593.64 |
| 2 1/8 in. | 2.76 | 404.12 | 297.35 | 252.29 | 207.24 | 117.14 | 3.20 | 713.00 | 468.55 |
| Front Roll Gear 100 T | | | | | | | | | |
| Diameter of Whirl | Ratio Whirl to Cylinder | Cyl. 20 T | | Cyl. 26 T | Cyl. 112 T | | Cyl. 26 T | Cyl. 132 T | |
| | | Const's | Stud 138 T | | Const's | Stud 132 T | | Const's | Stud 92 T |
| 1 in. | 7.80 | 1142.09 | 840.34 | 713.00 | 585.08 | 331.05 | 8.80 | 1288.51 | 948.07 |
| 1 1/16 in. | 7.27 | 1064.49 | 783.23 | 664.56 | 545.89 | 308.54 | 8.30 | 1186.02 | 872.65 |
| 1 1/8 in. | 6.81 | 997.13 | 733.67 | 622.51 | 511.35 | 289.02 | 7.80 | 1127.45 | 829.56 |
| 1 1/4 in. | 6.43 | 941.49 | 692.73 | 587.77 | 482.81 | 272.90 | 7.30 | 1068.88 | 786.45 |
| 1 3/8 in. | 6.09 | 891.71 | 656.10 | 556.69 | 457.33 | 258.46 | 6.80 | 1024.95 | 754.14 |
| 1 1/2 in. | 5.82 | 854.32 | 623.38 | 527.16 | 431.96 | 241.54 | 6.30 | 983.89 | 725.61 |
| 1 5/8 in. | 5.22 | 764.32 | 562.38 | 477.16 | 391.96 | 221.54 | 5.90 | 948.07 | 693.64 |
| 1 3/4 in. | 4.20 | 614.97 | 452.48 | 383.92 | 315.37 | 178.25 | 4.84 | 908.67 | 653.64 |
| 1 7/8 in. | 3.93 | 575.44 | 423.31 | 359.24 | 295.10 | 166.78 | 4.52 | 872.65 | 625.61 |
| 2 in. | 3.51 | 513.94 | 378.15 | 320.86 | 263.56 | 148.96 | 4.00 | 840.34 | 593.64 |
| 2 1/8 in. | 2.76 | 404.12 | 297.35 | 252.29 | 207.24 | 117.14 | 3.20 | 713.00 | 468.55 |
| Front Roll Gear 100 T | | | | | | | | | |
| Diameter of Whirl | Ratio Whirl to Cylinder | Cyl. 20 T | | Cyl. 26 T | Cyl. 112 T | | Cyl. 26 T | Cyl. 132 T | |
| | | Const's | Stud 138 T | | Const's | Stud 132 T | | Const's | Stud 92 T |
| 1 in. | 7.80 | 1142.09 | 840.34 | 713.00 | 585.08 | 331.05 | 8.80 | 1288.51 | 948.07 |
| 1 1/16 in. | 7.27 | 1064.49 | 783.23 | 664.56 | 545.89 | 308.54 | 8.30 | 1186.02 | 872.65 |
| 1 1/8 in. | 6.81 | 997.13 | 733.67 | 622.51 | 511.35 | 289.02 | 7.80 | 1127.45 | 829.56 |
| 1 1/4 in. | 6.43 | 941.49 | 692.73 | 587.77 | 482.81 | 272.90 | 7.30 | 1068.88 | 786.45 |
| 1 3/8 in. | 6.09 | 891.71 | 656.10 | 556.69 | 457.33 | 258.46 | 6.80 | 1024.95 | 754.14 |
| 1 1/2 in. | 5.82 | 854.32 | 623.38 | 527.16 | 431.96 | 241.54 | 6.30 | 983.89 | 725.61 |
| 1 5/8 in. | 5.22 | 764.32 | 562.38 | 477.16 | 391.96 | 221.54 | 5.90 | 948.07 | 693.64 |
| 1 3/4 in. | 4.20 | 614.97 | 452.48 | 383.92 | 315.37 | 178.25 | 4.84 | 908.67 | 653.64 |
| 1 7/8 in. | 3.93 | 575.44 | 423.31 | 359.24 | 295.10 | 166.78 | 4.52 | 872.65 | 625.61 |
| 2 in. | 3.51 | 513.94 | 378.15 | 320.86 | 263.56 | 148.96 | 4.00 | 840.34 | 593.64 |
| 2 1/8 in. | 2.76 | 404.12 | 297.35 | 252.29 | 207.24 | 117.14 | 3.20 | 713.00 | 468.55 |
| Front Roll Gear 100 T | | | | | | | | | |
| Diameter of Whirl | Ratio Whirl to Cylinder | Cyl. 20 T | | Cyl. 26 T | Cyl. 112 T | | Cyl. 26 T | Cyl. 132 T | |
| | | Const's | Stud 138 T | | Const's | Stud 132 T | | Const's | Stud 92 T |
| 1 in. | 7.80 | 1142.09 | 840.34 | 713.00 | 585.08 | 331.05 | 8.80 | 1288.51 | 948.07 |
| 1 1/16 in. | 7.27 | 1064.49 | 783.23 | 664.56 | 545.89 | 308.54 | 8.30 | 1186.02 | 872.65 |
| 1 1/8 in. | 6.81 | 997.13 | 733.67 | 622.51 | 511.35 | 289.02 | 7.80 | 1127.45 | 829.56 |
| 1 1/4 in. | 6.43 | 941.49 | 692.73 | 587.77 | 482.81 | 272.90 | 7.30 | 1068.88 | 786.45 |
| 1 3/8 in. | 6.09 | 891.71 | 656.10 | 556.69 | 457.33 | 258.46 | 6.80 | 1024.95 | 754.14 |
| 1 1/2 in. | 5.82 | 854.32 | 623.38 | 527.16 | 431.96 | 241.54 | 6.30 | 983.89 | 725.61 |
| 1 5/8 in. | 5.22 | 764.32 | 562.38 | 477.16 | 391.96 | 221.54 | 5.90 | 948.07 | 693.64 |
| 1 3/4 in. | 4.20 | 614.97 | 452.48 | 383.92 | 315.37 | 178.25 | 4.84 | 908.67 | 653.64 |
| 1 7/8 in. | 3.93 | 575.44 | 423.31 | 359.24 | 295.10 | 166.78 | 4.52 | 872.65 | 625.61 |
| 2 in. | 3.51 | 513.94 | 378.15 | 320.86 | 263.56 | 148.96 | 4.00 | 840.34 | 593.64 |
| 2 1/8 in. | 2.76 | 404.12 | 297.35 | 252.29 | 207.24 | 117.14 | 3.20 | 713.00 | 468.55 |

Rule to find Change Gear:—Divide Constant by Twist per Inch Required.

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 7.80

Whirl $\frac{7}{8}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15 | 76.14 | 56.02 | 47.53 | 39.05 | 22.07 |
| 16 | 71.38 | 52.52 | 44.56 | 36.61 | 20.69 |
| 17 | 67.18 | 49.43 | 41.94 | 34.45 | 19.47 |
| 18 | 63.45 | 46.69 | 39.61 | 32.54 | 18.39 |
| 19 | 60.11 | 44.23 | 37.53 | 30.83 | 17.42 |
| 20 | 57.10 | 42.02 | 35.66 | 29.28 | 16.55 |
| 21 | 54.39 | 40.02 | 33.95 | 27.89 | 15.76 |
| 22 | 51.91 | 38.20 | 32.41 | 26.62 | 15.05 |
| 23 | 49.66 | 36.54 | 31.00 | 25.46 | 14.39 |
| 24 | 47.58 | 35.01 | 29.71 | 24.40 | 13.79 |
| 25 | 45.68 | 33.61 | 28.52 | 23.43 | 13.24 |
| 26 | 43.93 | 32.32 | 27.42 | 22.53 | 12.73 |
| 27 | 42.30 | 31.12 | 26.41 | 21.69 | 12.26 |
| 28 | 40.79 | 30.01 | 25.46 | 20.92 | 11.82 |
| 29 | 39.38 | 28.98 | 24.59 | 20.20 | 11.42 |
| 30 | 38.07 | 28.01 | 23.77 | 19.52 | 11.04 |
| 31 | 36.84 | 27.11 | 23.00 | 18.89 | 10.68 |
| 32 | 35.69 | 26.26 | 22.28 | 18.30 | 10.35 |
| 33 | 34.61 | 25.46 | 21.61 | 17.75 | 10.03 |
| 34 | 33.59 | 24.71 | 20.97 | 17.23 | 9.74 |
| 35 | 32.63 | 24.01 | 20.37 | 16.73 | 9.46 |
| 36 | 31.72 | 23.34 | 19.81 | 16.27 | 9.20 |
| 37 | 30.87 | 22.71 | 19.27 | 15.83 | 8.95 |
| 38 | 30.06 | 22.11 | 18.76 | 15.41 | 8.71 |
| 39 | 29.28 | 21.55 | 18.28 | 15.02 | 8.49 |
| 40 | 28.55 | 21.01 | 17.83 | 14.64 | 8.28 |
| 41 | 27.86 | 20.50 | 17.39 | 14.28 | 8.07 |
| 42 | 27.19 | 20.01 | 16.98 | 13.94 | 7.88 |
| 43 | 26.56 | 19.54 | 16.58 | 13.62 | 7.70 |
| 44 | 25.96 | 19.10 | 16.20 | 13.31 | 7.52 |
| 45 | 25.38 | 18.67 | 15.84 | 13.02 | 7.36 |
| 46 | 24.83 | 18.27 | 15.50 | 12.73 | 7.20 |
| 47 | 24.30 | 17.88 | 15.17 | 12.46 | 7.04 |
| 48 | 23.79 | 17.51 | 14.85 | 12.20 | 6.90 |
| 49 | 23.31 | 17.15 | 14.55 | 11.95 | 6.76 |
| 50 | 22.84 | 16.81 | 14.26 | 11.71 | 6.62 |
| 51 | 22.39 | 16.48 | 13.98 | 11.48 | 6.49 |
| 52 | 21.96 | 16.16 | 13.71 | 11.26 | 6.37 |
| 53 | 21.55 | 15.86 | 13.45 | 11.05 | 6.25 |
| 54 | 21.15 | 15.56 | 13.20 | 10.85 | 6.13 |
| 55 | 20.77 | 15.28 | 12.96 | 10.65 | 6.02 |
| 56 | 20.39 | 15.01 | 12.73 | 10.46 | 5.91 |
| 57 | 20.04 | 14.74 | 12.51 | 10.28 | 5.81 |
| 58 | 19.69 | 14.49 | 12.29 | 10.10 | 5.71 |
| Const's | 1142.09 | 840.34 | 713.00 | 585.68 | 331.05 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 7.80

Whirl $\frac{7}{8}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 19.36 | 14.24 | 12.08 | 9.93 | 5.61 |
| 60 | 19.03 | 14.01 | 11.88 | 9.76 | 5.52 |
| 61 | 18.72 | 13.78 | 11.69 | 9.60 | 5.43 |
| 62 | 18.42 | 13.55 | 11.50 | 9.45 | 5.34 |
| 63 | 18.13 | 13.34 | 11.32 | 9.30 | 5.25 |
| 64 | 17.85 | 13.13 | 11.14 | 9.15 | 5.17 |
| 65 | 17.57 | 12.93 | 10.97 | 9.01 | 5.09 |
| 66 | 17.30 | 12.73 | 10.80 | 8.87 | 5.02 |
| 67 | 17.05 | 12.54 | 10.64 | 8.74 | 4.94 |
| 68 | 16.80 | 12.36 | 10.49 | 8.61 | 4.87 |
| 69 | 16.55 | 12.18 | 10.33 | 8.49 | 4.80 |
| 70 | 16.32 | 12.00 | 10.19 | 8.37 | 4.73 |
| 71 | 16.09 | 11.84 | 10.04 | 8.25 | 4.66 |
| 72 | 15.86 | 11.67 | 9.90 | 8.13 | 4.60 |
| 73 | 15.65 | 11.51 | 9.77 | 8.02 | 4.54 |
| 74 | 15.43 | 11.36 | 9.64 | 7.91 | 4.47 |
| 75 | 15.23 | 11.20 | 9.51 | 7.81 | 4.41 |
| 76 | 15.03 | 11.06 | 9.38 | 7.71 | 4.36 |
| 77 | 14.83 | 10.91 | 9.26 | 7.61 | 4.30 |
| 78 | 14.64 | 10.77 | 9.14 | 7.51 | 4.24 |
| 79 | 14.46 | 10.64 | 9.03 | 7.41 | 4.19 |
| 80 | 14.28 | 10.50 | 8.91 | 7.32 | 4.14 |
| 81 | 14.10 | 10.37 | 8.80 | 7.23 | 4.09 |
| 82 | 13.93 | 10.25 | 8.70 | 7.14 | 4.04 |
| 83 | 13.76 | 10.12 | 8.59 | 7.06 | 3.99 |
| 84 | 13.60 | 10.00 | 8.49 | 6.97 | 3.94 |
| 85 | 13.44 | 9.89 | 8.39 | 6.89 | 3.89 |
| 86 | 13.28 | 9.77 | 8.29 | 6.81 | 3.85 |
| 87 | 13.13 | 9.66 | 8.20 | 6.73 | 3.81 |
| 88 | 12.98 | 9.55 | 8.10 | 6.66 | 3.76 |
| 89 | 12.83 | 9.44 | 8.01 | 6.58 | 3.72 |
| 90 | 12.69 | 9.34 | 7.92 | 6.51 | 3.68 |
| 91 | 12.55 | 9.23 | 7.84 | 6.44 | 3.64 |
| 92 | 12.41 | 9.13 | 7.76 | 6.37 | 3.60 |
| 93 | 12.28 | 9.04 | 7.67 | 6.30 | 3.56 |
| 94 | 12.15 | 8.94 | 7.59 | 6.23 | 3.52 |
| 96 | 11.90 | 8.75 | 7.43 | 6.10 | 3.45 |
| 98 | 11.65 | 8.57 | 7.28 | 5.98 | 3.38 |
| 100 | 11.42 | 8.40 | 7.13 | 5.86 | 3.31 |
| 102 | 11.20 | 8.24 | 6.99 | 5.74 | 3.25 |
| 104 | 10.98 | 8.08 | 6.86 | 5.63 | 3.18 |
| 106 | 10.77 | 7.93 | 6.73 | 5.53 | 3.12 |
| 108 | 10.57 | 7.78 | 6.60 | 5.42 | 3.07 |
| 110 | 10.38 | 7.64 | 6.48 | 5.32 | 3.01 |
| Const's | 1142.09 | 840.34 | 713.00 | 585.68 | 331.05 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 7 inches Diameter Ratio Cylinder to Whirl 1 to 7.27
 Whirl $\frac{15}{16}$ inches Diameter Front Roll Gear 100 Teeth

| Change | Cyl. 20 | Cyl. 26 | Cyl. 26 | Cyl. 26 | Cyl. 46 |
|---------|----------|----------|----------|---------|---------|
| Gears | Stud 138 | Stud 132 | Stud 112 | Stud 92 | Stud 92 |
| | Twist | Twist | Twist | Twist | Twist |
| 15 | 70.96 | 52.22 | 44.30 | 36.39 | 20.57 |
| 16 | 66.53 | 48.95 | 41.54 | 34.12 | 19.28 |
| 17 | 62.62 | 46.07 | 39.09 | 32.11 | 18.15 |
| 18 | 59.14 | 43.51 | 36.92 | 30.33 | 17.14 |
| 19 | 56.03 | 41.22 | 34.98 | 28.73 | 16.24 |
| 20 | 53.23 | 39.16 | 33.23 | 27.29 | 15.43 |
| 21 | 50.69 | 37.30 | 31.65 | 25.99 | 14.69 |
| 22 | 48.39 | 35.60 | 30.21 | 24.81 | 14.02 |
| 23 | 46.28 | 34.05 | 28.89 | 23.73 | 13.41 |
| 24 | 44.35 | 32.63 | 27.69 | 22.75 | 12.86 |
| 25 | 42.58 | 31.33 | 26.58 | 21.84 | 12.34 |
| 26 | 40.94 | 30.12 | 25.56 | 21.00 | 11.87 |
| 27 | 39.43 | 29.01 | 24.61 | 20.22 | 11.43 |
| 28 | 38.02 | 27.97 | 23.73 | 19.50 | 11.02 |
| 29 | 36.71 | 27.01 | 22.92 | 18.82 | 10.64 |
| 30 | 35.48 | 26.11 | 22.15 | 18.20 | 10.29 |
| 31 | 34.34 | 25.27 | 21.44 | 17.61 | 9.95 |
| 32 | 33.26 | 24.48 | 20.77 | 17.06 | 9.64 |
| 33 | 32.26 | 23.73 | 20.14 | 16.54 | 9.35 |
| 34 | 31.31 | 23.04 | 19.55 | 16.06 | 9.07 |
| 35 | 30.41 | 22.38 | 18.99 | 15.60 | 8.81 |
| 36 | 29.57 | 21.76 | 18.46 | 15.16 | 8.57 |
| 37 | 28.77 | 21.17 | 17.96 | 14.75 | 8.34 |
| 38 | 28.01 | 20.61 | 17.49 | 14.37 | 8.12 |
| 39 | 27.29 | 20.08 | 17.04 | 14.00 | 7.91 |
| 40 | 26.61 | 19.58 | 16.61 | 13.65 | 7.71 |
| 41 | 25.96 | 19.10 | 16.21 | 13.31 | 7.53 |
| 42 | 25.35 | 18.65 | 15.82 | 13.00 | 7.34 |
| 43 | 24.75 | 18.21 | 15.45 | 12.70 | 7.18 |
| 44 | 24.19 | 17.80 | 15.10 | 12.41 | 7.01 |
| 45 | 23.65 | 17.42 | 14.77 | 12.13 | 6.86 |
| 46 | 23.14 | 17.03 | 14.45 | 11.87 | 6.71 |
| 47 | 22.65 | 16.66 | 14.14 | 11.61 | 6.56 |
| 48 | 22.18 | 16.32 | 13.85 | 11.37 | 6.43 |
| 49 | 21.72 | 15.98 | 13.56 | 11.14 | 6.30 |
| 50 | 21.29 | 15.67 | 13.29 | 10.92 | 6.17 |
| 51 | 20.87 | 15.36 | 13.03 | 10.70 | 6.05 |
| 52 | 20.47 | 15.06 | 12.78 | 10.52 | 5.93 |
| 53 | 20.08 | 14.78 | 12.54 | 10.30 | 5.82 |
| 54 | 19.71 | 14.50 | 12.31 | 10.11 | 5.71 |
| 55 | 19.35 | 14.24 | 12.08 | 9.92 | 5.61 |
| 56 | 19.01 | 13.99 | 11.87 | 9.75 | 5.51 |
| 57 | 18.70 | 13.74 | 11.66 | 9.58 | 5.41 |
| 58 | 18.35 | 13.50 | 11.46 | 9.41 | 5.32 |
| Const's | 1064.49 | 783.23 | 664.56 | 545.89 | 308.54 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll 1½ inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 7.27

Whirl 15/16 inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 18.04 | 13.28 | 11.26 | 9.25 | 5.23 |
| 60 | 17.74 | 13.05 | 11.08 | 9.07 | 5.14 |
| 61 | 17.45 | 12.84 | 10.89 | 8.95 | 5.06 |
| 62 | 17.17 | 12.63 | 10.72 | 8.80 | 4.98 |
| 63 | 16.90 | 12.43 | 10.55 | 8.66 | 4.89 |
| 64 | 16.63 | 12.24 | 10.38 | 8.53 | 4.82 |
| 65 | 16.38 | 12.05 | 10.22 | 8.40 | 4.75 |
| 66 | 16.13 | 11.87 | 10.07 | 8.27 | 4.67 |
| 67 | 15.89 | 11.69 | 9.92 | 8.15 | 4.61 |
| 68 | 15.65 | 11.52 | 9.77 | 8.03 | 4.54 |
| 69 | 15.43 | 11.35 | 9.63 | 7.91 | 4.47 |
| 70 | 15.21 | 11.19 | 9.49 | 7.80 | 4.41 |
| 71 | 14.99 | 11.03 | 9.36 | 7.69 | 4.35 |
| 72 | 14.78 | 10.88 | 9.23 | 7.58 | 4.29 |
| 73 | 14.58 | 10.73 | 9.10 | 7.48 | 4.23 |
| 74 | 14.39 | 10.58 | 8.98 | 7.38 | 4.17 |
| 75 | 14.19 | 10.44 | 8.86 | 7.28 | 4.11 |
| 76 | 14.01 | 10.31 | 8.74 | 7.18 | 4.06 |
| 77 | 13.82 | 10.17 | 8.63 | 7.09 | 4.01 |
| 78 | 13.65 | 10.04 | 8.52 | 7.00 | 3.96 |
| 79 | 13.47 | 9.91 | 8.41 | 6.91 | 3.91 |
| 80 | 13.31 | 9.79 | 8.31 | 6.82 | 3.86 |
| 81 | 13.14 | 9.67 | 8.20 | 6.74 | 3.81 |
| 82 | 12.98 | 9.55 | 8.10 | 6.66 | 3.76 |
| 83 | 12.83 | 9.44 | 8.00 | 6.58 | 3.72 |
| 84 | 12.67 | 9.32 | 7.91 | 6.50 | 3.67 |
| 85 | 12.52 | 9.21 | 7.82 | 6.42 | 3.63 |
| 86 | 12.38 | 9.11 | 7.73 | 6.35 | 3.59 |
| 87 | 12.24 | 9.00 | 7.64 | 6.27 | 3.55 |
| 88 | 12.10 | 8.90 | 7.55 | 6.20 | 3.51 |
| 89 | 11.96 | 8.80 | 7.47 | 6.13 | 3.47 |
| 90 | 11.83 | 8.70 | 7.38 | 6.07 | 3.43 |
| 91 | 11.70 | 8.61 | 7.30 | 6.00 | 3.39 |
| 92 | 11.57 | 8.51 | 7.22 | 5.93 | 3.35 |
| 93 | 11.45 | 8.42 | 7.15 | 5.87 | 3.32 |
| 94 | 11.33 | 8.33 | 7.07 | 5.81 | 3.28 |
| 96 | 11.00 | 8.16 | 6.92 | 5.69 | 3.21 |
| 98 | 10.86 | 7.99 | 6.78 | 5.57 | 3.15 |
| 100 | 10.64 | 7.83 | 6.65 | 5.46 | 3.09 |
| 102 | 10.44 | 7.68 | 6.51 | 5.35 | 3.02 |
| 104 | 10.24 | 7.53 | 6.39 | 5.25 | 2.97 |
| 106 | 10.04 | 7.39 | 6.27 | 5.15 | 2.91 |
| 108 | 9.86 | 7.25 | 6.15 | 5.05 | 2.86 |
| 110 | 9.68 | 7.12 | 6.04 | 4.96 | 2.80 |
| Const's | 1064.49 | 783.23 | 664.56 | 545.89 | 308.54 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll 1½ inch Diameter

Cylinder 7 inches Diameter Ratio Cylinder to Whirl 1 to 6.81
 Whirl 1 inch Diameter Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15 | 66.48 | 48.91 | 41.50 | 34.09 | 19.27 |
| 16 | 62.32 | 45.85 | 38.91 | 31.96 | 18.06 |
| 17 | 58.65 | 43.16 | 36.62 | 30.08 | 17.00 |
| 18 | 55.40 | 40.75 | 34.58 | 28.41 | 16.06 |
| 19 | 52.48 | 38.61 | 32.76 | 26.91 | 15.21 |
| 20 | 49.86 | 36.68 | 31.13 | 25.57 | 14.45 |
| 21 | 47.48 | 34.93 | 29.64 | 24.35 | 13.76 |
| 22 | 45.32 | 33.35 | 28.30 | 23.24 | 13.14 |
| 23 | 43.35 | 31.90 | 27.07 | 22.23 | 12.57 |
| 24 | 41.55 | 30.57 | 25.94 | 21.31 | 12.04 |
| 25 | 39.89 | 29.35 | 24.90 | 20.45 | 11.56 |
| 26 | 38.35 | 28.22 | 23.94 | 19.67 | 11.12 |
| 27 | 36.93 | 27.17 | 23.06 | 18.94 | 10.70 |
| 28 | 35.61 | 26.20 | 22.23 | 18.26 | 10.32 |
| 29 | 34.38 | 25.30 | 21.47 | 17.63 | 9.96 |
| 30 | 33.24 | 24.46 | 20.75 | 17.05 | 9.63 |
| 31 | 32.17 | 23.67 | 20.08 | 16.50 | 9.32 |
| 32 | 31.16 | 22.93 | 19.45 | 15.98 | 9.03 |
| 33 | 30.22 | 22.23 | 18.86 | 15.50 | 8.76 |
| 34 | 29.32 | 21.58 | 18.31 | 15.04 | 8.50 |
| 35 | 28.49 | 20.96 | 17.79 | 14.61 | 8.26 |
| 36 | 27.70 | 20.38 | 17.29 | 14.20 | 8.02 |
| 37 | 26.95 | 19.83 | 16.82 | 13.82 | 7.81 |
| 38 | 26.24 | 19.31 | 16.38 | 13.46 | 7.61 |
| 39 | 25.57 | 18.81 | 15.96 | 13.11 | 7.41 |
| 40 | 24.93 | 18.34 | 15.56 | 12.78 | 7.23 |
| 41 | 24.32 | 17.89 | 15.18 | 12.47 | 7.05 |
| 42 | 23.74 | 17.47 | 14.82 | 12.18 | 6.88 |
| 43 | 23.19 | 17.06 | 14.48 | 11.89 | 6.72 |
| 44 | 22.66 | 16.67 | 14.15 | 11.62 | 6.57 |
| 45 | 22.16 | 16.30 | 13.83 | 11.36 | 6.42 |
| 46 | 21.68 | 15.95 | 13.53 | 11.12 | 6.28 |
| 47 | 21.22 | 15.61 | 13.24 | 10.88 | 6.15 |
| 48 | 20.77 | 15.28 | 12.97 | 10.65 | 6.02 |
| 49 | 20.35 | 14.97 | 12.70 | 10.44 | 5.90 |
| 50 | 19.94 | 14.67 | 12.45 | 10.22 | 5.78 |
| 51 | 19.55 | 14.39 | 12.21 | 10.02 | 5.67 |
| 52 | 19.18 | 14.11 | 11.97 | 9.83 | 5.56 |
| 53 | 18.81 | 13.84 | 11.75 | 9.65 | 5.45 |
| 54 | 18.47 | 13.58 | 11.53 | 9.47 | 5.35 |
| 55 | 18.13 | 13.33 | 11.32 | 9.30 | 5.26 |
| 56 | 17.81 | 13.10 | 11.12 | 9.13 | 5.16 |
| 57 | 17.49 | 12.87 | 10.92 | 8.97 | 5.07 |
| 58 | 17.19 | 12.64 | 10.73 | 8.82 | 4.98 |
| Const's | 997.13 | 733.67 | 622.51 | 511.35 | 289.02 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll 1½ inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 6.81

Whirl 1 inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 16.90 | 12.44 | 10.55 | 8.67 | 4.90 |
| 60 | 16.62 | 12.23 | 10.38 | 8.52 | 4.82 |
| 61 | 16.35 | 12.03 | 10.21 | 8.38 | 4.74 |
| 62 | 16.08 | 11.83 | 10.04 | 8.25 | 4.66 |
| 63 | 15.83 | 11.65 | 9.88 | 8.12 | 4.59 |
| 64 | 15.58 | 11.46 | 9.73 | 7.99 | 4.52 |
| 65 | 15.34 | 11.29 | 9.57 | 7.87 | 4.45 |
| 66 | 15.11 | 11.12 | 9.43 | 7.75 | 4.38 |
| 67 | 14.88 | 10.95 | 9.29 | 7.63 | 4.31 |
| 68 | 14.66 | 10.79 | 9.15 | 7.52 | 4.25 |
| 69 | 14.45 | 10.63 | 9.02 | 7.41 | 4.19 |
| 70 | 14.24 | 10.48 | 8.89 | 7.31 | 4.13 |
| 71 | 14.04 | 10.33 | 8.77 | 7.20 | 4.07 |
| 72 | 13.85 | 10.19 | 8.65 | 7.10 | 4.01 |
| 73 | 13.66 | 10.05 | 8.53 | 7.00 | 3.96 |
| 74 | 13.47 | 9.91 | 8.41 | 6.91 | 3.91 |
| 75 | 13.30 | 9.78 | 8.30 | 6.82 | 3.85 |
| 76 | 13.12 | 9.65 | 8.19 | 6.73 | 3.80 |
| 77 | 12.95 | 9.53 | 8.08 | 6.64 | 3.75 |
| 78 | 12.78 | 9.41 | 7.98 | 6.56 | 3.71 |
| 79 | 12.62 | 9.29 | 7.88 | 6.47 | 3.66 |
| 80 | 12.46 | 9.17 | 7.78 | 6.39 | 3.61 |
| 81 | 12.31 | 9.04 | 7.69 | 6.31 | 3.57 |
| 82 | 12.16 | 8.95 | 7.59 | 6.24 | 3.52 |
| 83 | 12.01 | 8.84 | 7.50 | 6.16 | 3.48 |
| 84 | 11.87 | 8.73 | 7.41 | 6.09 | 3.44 |
| 85 | 11.73 | 8.63 | 7.32 | 6.02 | 3.40 |
| 86 | 11.59 | 8.53 | 7.24 | 5.95 | 3.36 |
| 87 | 11.46 | 8.43 | 7.16 | 5.88 | 3.32 |
| 88 | 11.33 | 8.34 | 7.07 | 5.81 | 3.28 |
| 89 | 11.20 | 8.24 | 6.99 | 5.75 | 3.25 |
| 90 | 11.08 | 8.15 | 6.92 | 5.68 | 3.21 |
| 91 | 10.96 | 8.06 | 6.84 | 5.62 | 3.18 |
| 92 | 10.84 | 7.97 | 6.77 | 5.56 | 3.14 |
| 93 | 10.72 | 7.89 | 6.69 | 5.50 | 3.11 |
| 94 | 10.61 | 7.81 | 6.62 | 5.44 | 3.07 |
| 96 | 10.39 | 7.64 | 6.48 | 5.33 | 3.01 |
| 98 | 10.17 | 7.49 | 6.35 | 5.22 | 2.95 |
| 100 | 9.97 | 7.34 | 6.22 | 5.11 | 2.89 |
| 102 | 9.78 | 7.19 | 6.10 | 5.01 | 2.83 |
| 104 | 9.59 | 7.05 | 5.99 | 4.92 | 2.78 |
| 106 | 9.41 | 6.92 | 5.87 | 4.82 | 2.73 |
| 108 | 9.23 | 6.79 | 5.76 | 4.73 | 2.68 |
| 110 | 9.06 | 6.67 | 5.66 | 4.65 | 2.63 |
| Const's | 997.13 | 733.67 | 622.51 | 511.35 | 289.02 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 7 inches Diameter Ratio Cylinder to Whirl 1 to 6.43
 Whirl $1\frac{1}{16}$ inch Diameter Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15 | 62.77 | 46.18 | 39.19 | 32.19 | 18.19 |
| 16 | 58.84 | 43.30 | 36.74 | 30.18 | 17.06 |
| 17 | 55.38 | 40.75 | 34.57 | 28.40 | 16.05 |
| 18 | 52.31 | 38.49 | 32.65 | 26.82 | 15.16 |
| 19 | 49.55 | 36.46 | 30.94 | 25.41 | 14.36 |
| 20 | 47.07 | 34.64 | 29.39 | 24.14 | 13.65 |
| 21 | 44.83 | 32.99 | 27.99 | 22.99 | 13.00 |
| 22 | 42.80 | 31.49 | 26.72 | 21.95 | 12.40 |
| 23 | 40.93 | 30.12 | 25.56 | 20.99 | 11.87 |
| 24 | 39.23 | 28.86 | 24.49 | 20.12 | 11.37 |
| 25 | 37.66 | 27.71 | 23.51 | 19.31 | 10.92 |
| 26 | 36.21 | 26.64 | 22.61 | 18.57 | 10.50 |
| 27 | 34.87 | 25.66 | 21.77 | 17.88 | 10.11 |
| 28 | 33.63 | 24.74 | 20.99 | 17.24 | 9.75 |
| 29 | 32.47 | 23.89 | 20.27 | 16.65 | 9.41 |
| 30 | 31.38 | 23.09 | 19.59 | 16.09 | 9.10 |
| 31 | 30.37 | 22.35 | 18.96 | 15.57 | 8.80 |
| 32 | 29.42 | 21.65 | 18.37 | 15.09 | 8.53 |
| 33 | 28.53 | 20.99 | 17.81 | 14.63 | 8.27 |
| 34 | 27.69 | 20.37 | 17.26 | 14.20 | 8.03 |
| 35 | 26.90 | 19.79 | 16.79 | 13.79 | 7.80 |
| 36 | 26.15 | 19.24 | 16.33 | 13.41 | 7.58 |
| 37 | 25.45 | 18.72 | 15.89 | 13.05 | 7.38 |
| 38 | 24.78 | 18.23 | 15.47 | 12.71 | 7.18 |
| 39 | 24.14 | 17.76 | 15.07 | 12.38 | 7.00 |
| 40 | 23.54 | 17.32 | 14.69 | 12.07 | 6.82 |
| 41 | 22.96 | 16.90 | 14.34 | 11.78 | 6.66 |
| 42 | 22.46 | 16.50 | 13.99 | 11.50 | 6.50 |
| 43 | 21.90 | 16.11 | 13.67 | 11.23 | 6.35 |
| 44 | 21.40 | 15.74 | 13.36 | 10.97 | 6.20 |
| 45 | 20.92 | 15.39 | 13.06 | 10.73 | 6.06 |
| 46 | 20.47 | 15.06 | 12.78 | 10.50 | 5.93 |
| 47 | 20.03 | 14.74 | 12.51 | 10.27 | 5.81 |
| 48 | 19.61 | 14.44 | 12.25 | 10.06 | 5.69 |
| 49 | 19.21 | 14.14 | 12.00 | 9.85 | 5.57 |
| 50 | 18.83 | 13.85 | 11.75 | 9.66 | 5.46 |
| 51 | 18.46 | 13.58 | 11.53 | 9.47 | 5.35 |
| 52 | 18.11 | 13.32 | 11.30 | 9.29 | 5.25 |
| 53 | 17.77 | 13.07 | 11.09 | 9.11 | 5.15 |
| 54 | 17.44 | 12.83 | 10.89 | 8.94 | 5.05 |
| 55 | 17.12 | 12.60 | 10.69 | 8.78 | 4.96 |
| 56 | 16.81 | 12.37 | 10.50 | 8.62 | 4.87 |
| 57 | 16.52 | 12.15 | 10.31 | 8.47 | 4.79 |
| 58 | 16.23 | 11.94 | 10.13 | 8.32 | 4.71 |
| Const's | 941.49 | 692.73 | 587.77 | 482.81 | 272.90 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 6.43

Whirl $1\frac{1}{16}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 15.95 | 11.74 | 9.96 | 8.18 | 4.63 |
| 60 | 15.69 | 11.55 | 9.80 | 8.05 | 4.55 |
| 61 | 15.43 | 11.36 | 9.64 | 7.91 | 4.47 |
| 62 | 15.18 | 11.17 | 9.48 | 7.79 | 4.40 |
| 63 | 14.94 | 11.00 | 9.33 | 7.66 | 4.33 |
| 64 | 14.71 | 10.82 | 9.18 | 7.54 | 4.26 |
| 65 | 14.49 | 10.66 | 9.04 | 7.43 | 4.20 |
| 66 | 14.27 | 10.50 | 8.91 | 7.32 | 4.14 |
| 67 | 14.05 | 10.34 | 8.78 | 7.21 | 4.07 |
| 68 | 13.84 | 10.19 | 8.64 | 7.10 | 4.01 |
| 69 | 13.64 | 10.04 | 8.52 | 7.00 | 3.96 |
| 70 | 13.45 | 9.90 | 8.40 | 6.90 | 3.90 |
| 71 | 13.26 | 9.76 | 8.28 | 6.80 | 3.84 |
| 72 | 13.07 | 9.62 | 8.16 | 6.71 | 3.79 |
| 73 | 12.90 | 9.49 | 8.05 | 6.61 | 3.74 |
| 74 | 12.73 | 9.36 | 7.94 | 6.53 | 3.69 |
| 75 | 12.55 | 9.24 | 7.83 | 6.44 | 3.64 |
| 76 | 12.39 | 9.12 | 7.73 | 6.35 | 3.59 |
| 77 | 12.23 | 9.00 | 7.63 | 6.27 | 3.54 |
| 78 | 12.07 | 8.88 | 7.54 | 6.19 | 3.50 |
| 79 | 11.92 | 8.77 | 7.44 | 6.11 | 3.45 |
| 80 | 11.77 | 8.66 | 7.35 | 6.04 | 3.41 |
| 81 | 11.62 | 8.55 | 7.26 | 5.96 | 3.37 |
| 82 | 11.48 | 8.45 | 7.17 | 5.89 | 3.33 |
| 83 | 11.34 | 8.35 | 7.08 | 5.82 | 3.29 |
| 84 | 11.21 | 8.25 | 7.00 | 5.75 | 3.25 |
| 85 | 11.08 | 8.15 | 6.92 | 5.68 | 3.21 |
| 86 | 10.95 | 8.06 | 6.83 | 5.61 | 3.17 |
| 87 | 10.82 | 7.96 | 6.76 | 5.55 | 3.14 |
| 88 | 10.70 | 7.87 | 6.68 | 5.49 | 3.10 |
| 89 | 10.58 | 7.78 | 6.60 | 5.43 | 3.07 |
| 90 | 10.46 | 7.70 | 6.53 | 5.36 | 3.03 |
| 91 | 10.35 | 7.61 | 6.46 | 5.31 | 3.00 |
| 92 | 10.23 | 7.53 | 6.39 | 5.25 | 2.97 |
| 93 | 10.12 | 7.45 | 6.32 | 5.19 | 2.93 |
| 94 | 10.02 | 7.37 | 6.25 | 5.14 | 2.90 |
| 96 | 9.81 | 7.22 | 6.12 | 5.03 | 2.84 |
| 98 | 9.61 | 7.07 | 6.00 | 4.93 | 2.78 |
| 100 | 9.41 | 6.93 | 5.88 | 4.83 | 2.73 |
| 102 | 9.23 | 6.80 | 5.76 | 4.73 | 2.68 |
| 104 | 9.05 | 6.66 | 5.65 | 4.64 | 2.62 |
| 106 | 8.88 | 6.54 | 5.55 | 4.56 | 2.57 |
| 108 | 8.72 | 6.41 | 5.44 | 4.47 | 2.53 |
| 110 | 8.56 | 6.30 | 5.34 | 4.39 | 2.48 |
| Const's | 941.49 | 692.73 | 587.77 | 482.81 | 272.90 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 7 inches Diameter Ratio Cylinder to Whirl 1 to 6.09
 Whirl $1\frac{1}{8}$ inch Diameter Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15 | 59.45 | 43.74 | 37.11 | 30.49 | 17.23 |
| 16 | 55.73 | 41.01 | 34.79 | 28.58 | 16.15 |
| 17 | 52.45 | 38.59 | 32.75 | 26.90 | 15.20 |
| 18 | 49.54 | 36.45 | 30.93 | 25.41 | 14.36 |
| 19 | 46.93 | 34.53 | 29.30 | 24.18 | 13.60 |
| 20 | 44.59 | 32.81 | 27.83 | 22.87 | 12.92 |
| 21 | 42.46 | 31.24 | 26.51 | 21.78 | 12.31 |
| 22 | 40.53 | 29.82 | 25.30 | 20.79 | 11.75 |
| 23 | 38.77 | 28.53 | 24.20 | 19.88 | 11.24 |
| 24 | 37.15 | 27.34 | 23.20 | 19.06 | 10.77 |
| 25 | 35.66 | 26.24 | 22.27 | 18.29 | 10.34 |
| 26 | 34.29 | 25.23 | 21.41 | 17.59 | 9.94 |
| 27 | 33.03 | 24.30 | 20.62 | 16.94 | 9.57 |
| 28 | 31.85 | 23.43 | 19.88 | 16.33 | 9.23 |
| 29 | 30.75 | 22.62 | 19.20 | 15.77 | 8.91 |
| 30 | 29.72 | 21.87 | 18.56 | 15.24 | 8.62 |
| 31 | 28.76 | 21.16 | 17.96 | 14.75 | 8.34 |
| 32 | 27.87 | 20.50 | 17.40 | 14.29 | 8.08 |
| 33 | 27.02 | 19.88 | 16.87 | 13.86 | 7.83 |
| 34 | 26.23 | 19.30 | 16.37 | 13.45 | 7.60 |
| 35 | 25.48 | 18.75 | 15.91 | 13.07 | 7.38 |
| 36 | 24.77 | 18.23 | 15.46 | 12.70 | 7.18 |
| 37 | 24.10 | 17.73 | 15.05 | 12.36 | 6.99 |
| 38 | 23.47 | 17.27 | 14.65 | 12.04 | 6.80 |
| 39 | 22.86 | 16.82 | 14.27 | 11.73 | 6.63 |
| 40 | 22.29 | 16.40 | 13.92 | 11.43 | 6.46 |
| 41 | 21.75 | 16.00 | 13.58 | 11.15 | 6.30 |
| 42 | 21.23 | 15.62 | 13.25 | 10.89 | 6.15 |
| 43 | 20.74 | 15.26 | 12.95 | 10.64 | 6.01 |
| 44 | 20.27 | 14.91 | 12.65 | 10.39 | 5.87 |
| 45 | 19.82 | 14.59 | 12.37 | 10.16 | 5.74 |
| 46 | 19.39 | 14.26 | 12.10 | 9.94 | 5.62 |
| 47 | 18.97 | 13.96 | 11.84 | 9.73 | 5.50 |
| 48 | 18.58 | 13.67 | 11.60 | 9.53 | 5.38 |
| 49 | 18.20 | 13.39 | 11.36 | 9.33 | 5.27 |
| 50 | 17.83 | 13.12 | 11.13 | 9.15 | 5.17 |
| 51 | 17.48 | 12.86 | 10.92 | 8.97 | 5.07 |
| 52 | 17.15 | 12.62 | 10.71 | 8.79 | 4.97 |
| 53 | 16.82 | 12.38 | 10.50 | 8.63 | 4.88 |
| 54 | 16.51 | 12.15 | 10.31 | 8.47 | 4.79 |
| 55 | 16.21 | 11.92 | 10.12 | 8.32 | 4.70 |
| 56 | 15.92 | 11.72 | 9.94 | 8.17 | 4.62 |
| 57 | 15.64 | 11.51 | 9.77 | 8.02 | 4.53 |
| 58 | 15.37 | 11.31 | 9.60 | 7.89 | 4.46 |
| Const's | 891.71 | 656.10 | 556.69 | 457.33 | 258.46 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll 1½ inch Diameter

Cylinder 7 inches Diameter Ratio Cylinder to Whirl 1 to 6.09
 Whirl 1½ inch Diameter Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 15.11 | 11.12 | 9.44 | 7.75 | 4.38 |
| 60 | 14.86 | 10.94 | 9.28 | 7.62 | 4.31 |
| 61 | 14.62 | 10.76 | 9.13 | 7.50 | 4.24 |
| 62 | 14.38 | 10.58 | 8.98 | 7.38 | 4.17 |
| 63 | 14.15 | 10.41 | 8.84 | 7.26 | 4.10 |
| 64 | 13.93 | 10.25 | 8.70 | 7.15 | 4.04 |
| 65 | 13.72 | 10.09 | 8.56 | 7.04 | 3.98 |
| 66 | 13.51 | 9.94 | 8.43 | 6.93 | 3.92 |
| 67 | 13.31 | 9.79 | 8.31 | 6.83 | 3.86 |
| 68 | 13.11 | 9.65 | 8.19 | 6.73 | 3.80 |
| 69 | 12.92 | 9.51 | 8.07 | 6.63 | 3.75 |
| 70 | 12.74 | 9.37 | 7.95 | 6.53 | 3.69 |
| 71 | 12.56 | 9.24 | 7.84 | 6.44 | 3.64 |
| 72 | 12.38 | 9.11 | 7.73 | 6.35 | 3.59 |
| 73 | 12.22 | 8.99 | 7.63 | 6.26 | 3.54 |
| 74 | 12.05 | 8.86 | 7.52 | 6.18 | 3.49 |
| 75 | 11.89 | 8.75 | 7.42 | 6.10 | 3.45 |
| 76 | 11.73 | 8.63 | 7.32 | 6.02 | 3.40 |
| 77 | 11.58 | 8.52 | 7.23 | 5.94 | 3.36 |
| 78 | 11.43 | 8.41 | 7.14 | 5.86 | 3.31 |
| 79 | 11.29 | 8.31 | 7.05 | 5.79 | 3.27 |
| 80 | 11.15 | 8.20 | 6.96 | 5.72 | 3.23 |
| 81 | 11.01 | 8.10 | 6.87 | 5.65 | 3.19 |
| 82 | 10.87 | 8.00 | 6.79 | 5.58 | 3.15 |
| 83 | 10.74 | 7.90 | 6.71 | 5.51 | 3.11 |
| 84 | 10.62 | 7.81 | 6.63 | 5.44 | 3.08 |
| 85 | 10.49 | 7.71 | 6.55 | 5.38 | 3.04 |
| 86 | 10.37 | 7.63 | 6.47 | 5.32 | 3.01 |
| 87 | 10.25 | 7.54 | 6.40 | 5.26 | 2.97 |
| 88 | 10.13 | 7.46 | 6.33 | 5.20 | 2.94 |
| 89 | 10.02 | 7.37 | 6.25 | 5.14 | 2.90 |
| 90 | 9.91 | 7.29 | 6.18 | 5.08 | 2.87 |
| 91 | 9.80 | 7.21 | 6.12 | 5.03 | 2.84 |
| 92 | 9.69 | 7.13 | 6.05 | 4.97 | 2.81 |
| 93 | 9.60 | 7.05 | 5.99 | 4.92 | 2.78 |
| 94 | 9.49 | 6.98 | 5.92 | 4.87 | 2.75 |
| 96 | 9.29 | 6.83 | 5.80 | 4.76 | 2.69 |
| 98 | 9.10 | 6.69 | 5.68 | 4.67 | 2.64 |
| 100 | 8.92 | 6.56 | 5.57 | 4.57 | 2.58 |
| 102 | 8.74 | 6.43 | 5.46 | 4.48 | 2.53 |
| 104 | 8.57 | 6.31 | 5.35 | 4.40 | 2.49 |
| 106 | 8.41 | 6.19 | 5.25 | 4.31 | 2.44 |
| 108 | 8.26 | 6.08 | 5.15 | 4.23 | 2.39 |
| 110 | 8.11 | 5.96 | 5.06 | 4.16 | 2.35 |
| Const's | 891.71 | 656.10 | 556.69 | 457.33 | 258.46 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 5.22

Whirl $1\frac{5}{16}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15 | 50.95 | 37.49 | 31.81 | 26.13 | 14.77 |
| 16 | 47.77 | 35.15 | 29.82 | 24.50 | 13.84 |
| 17 | 44.96 | 33.08 | 28.07 | 23.06 | 13.03 |
| 18 | 42.46 | 31.24 | 26.51 | 21.78 | 12.31 |
| 19 | 40.23 | 29.60 | 25.11 | 20.63 | 11.66 |
| 20 | 38.22 | 28.12 | 23.86 | 19.60 | 11.08 |
| 21 | 36.40 | 26.78 | 22.72 | 18.66 | 10.55 |
| 22 | 34.74 | 25.56 | 21.69 | 17.82 | 10.07 |
| 23 | 33.23 | 24.45 | 20.75 | 17.04 | 9.63 |
| 24 | 31.85 | 23.43 | 19.88 | 16.33 | 9.23 |
| 25 | 30.57 | 22.50 | 19.09 | 15.68 | 8.86 |
| 26 | 29.40 | 21.63 | 18.35 | 15.08 | 8.52 |
| 27 | 28.31 | 20.83 | 17.67 | 14.52 | 8.20 |
| 28 | 27.30 | 20.09 | 17.04 | 14.00 | 7.91 |
| 29 | 26.36 | 19.39 | 16.45 | 13.52 | 7.64 |
| 30 | 25.48 | 18.75 | 15.91 | 13.07 | 7.39 |
| 31 | 24.66 | 18.14 | 15.39 | 12.64 | 7.14 |
| 32 | 23.89 | 17.57 | 14.91 | 12.25 | 6.92 |
| 33 | 23.46 | 17.04 | 14.46 | 11.88 | 6.71 |
| 34 | 22.48 | 16.54 | 14.04 | 11.53 | 6.51 |
| 35 | 21.84 | 16.06 | 13.63 | 11.20 | 6.33 |
| 36 | 21.23 | 15.62 | 13.25 | 10.89 | 6.15 |
| 37 | 20.66 | 15.20 | 12.90 | 10.59 | 5.99 |
| 38 | 20.11 | 14.80 | 12.56 | 10.31 | 5.83 |
| 39 | 19.60 | 14.42 | 12.23 | 10.05 | 5.68 |
| 40 | 19.11 | 14.06 | 11.93 | 9.80 | 5.54 |
| 41 | 18.64 | 13.72 | 11.64 | 9.56 | 5.40 |
| 42 | 18.20 | 13.39 | 11.36 | 9.33 | 5.27 |
| 43 | 17.77 | 13.08 | 11.10 | 9.12 | 5.15 |
| 44 | 17.37 | 12.78 | 10.84 | 8.91 | 5.04 |
| 45 | 16.98 | 12.50 | 10.60 | 8.71 | 4.92 |
| 46 | 16.62 | 12.23 | 10.37 | 8.52 | 4.82 |
| 47 | 16.26 | 11.97 | 10.15 | 8.34 | 4.71 |
| 48 | 15.92 | 11.72 | 9.94 | 8.17 | 4.62 |
| 49 | 15.60 | 11.48 | 9.74 | 8.00 | 4.52 |
| 50 | 15.29 | 11.25 | 9.54 | 7.84 | 4.43 |
| 51 | 14.99 | 11.03 | 9.36 | 7.69 | 4.34 |
| 52 | 14.70 | 10.82 | 9.18 | 7.54 | 4.26 |
| 53 | 14.42 | 10.61 | 9.00 | 7.40 | 4.18 |
| 54 | 14.15 | 10.41 | 8.84 | 7.26 | 4.10 |
| 55 | 13.90 | 10.23 | 8.67 | 7.13 | 4.03 |
| 56 | 13.65 | 10.04 | 8.52 | 7.00 | 3.96 |
| 57 | 13.41 | 9.87 | 8.37 | 6.88 | 3.89 |
| 58 | 13.17 | 9.70 | 8.23 | 6.76 | 3.82 |
| Const's | 764.32 | 562.38 | 477.16 | 391.96 | 221.54 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll 1½ inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 5.22

Whirl 1 $\frac{5}{16}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 12.93 | 9.53 | 8.09 | 6.64 | 3.76 |
| 60 | 12.74 | 9.37 | 7.95 | 6.53 | 3.69 |
| 61 | 12.53 | 9.22 | 7.82 | 6.43 | 3.63 |
| 62 | 12.33 | 9.07 | 7.70 | 6.32 | 3.57 |
| 63 | 12.13 | 8.93 | 7.57 | 6.22 | 3.51 |
| 64 | 11.94 | 8.79 | 7.46 | 6.12 | 3.46 |
| 65 | 11.76 | 8.65 | 7.34 | 6.03 | 3.40 |
| 66 | 11.58 | 8.52 | 7.23 | 5.94 | 3.36 |
| 67 | 11.41 | 8.39 | 7.12 | 5.85 | 3.31 |
| 68 | 11.24 | 8.27 | 7.01 | 5.76 | 3.26 |
| 69 | 11.08 | 8.15 | 6.91 | 5.68 | 3.21 |
| 70 | 10.92 | 8.03 | 6.82 | 5.60 | 3.17 |
| 71 | 10.77 | 7.92 | 6.72 | 5.52 | 3.12 |
| 72 | 10.62 | 7.81 | 6.63 | 5.44 | 3.08 |
| 73 | 10.47 | 7.70 | 6.54 | 5.37 | 3.03 |
| 74 | 10.33 | 7.60 | 6.45 | 5.30 | 2.99 |
| 75 | 10.19 | 7.50 | 6.36 | 5.23 | 2.95 |
| 76 | 10.06 | 7.40 | 6.28 | 5.16 | 2.91 |
| 77 | 9.93 | 7.30 | 6.20 | 5.09 | 2.88 |
| 78 | 9.80 | 7.21 | 6.12 | 5.03 | 2.84 |
| 79 | 9.67 | 7.12 | 6.04 | 4.96 | 2.80 |
| 80 | 9.58 | 7.03 | 5.96 | 4.90 | 2.77 |
| 81 | 9.44 | 6.94 | 5.89 | 4.84 | 2.74 |
| 82 | 9.32 | 6.86 | 5.82 | 4.78 | 2.70 |
| 83 | 9.21 | 6.78 | 5.75 | 4.72 | 2.67 |
| 84 | 9.10 | 6.70 | 5.68 | 4.67 | 2.64 |
| 85 | 8.99 | 6.62 | 5.61 | 4.61 | 2.61 |
| 86 | 8.89 | 6.54 | 5.55 | 4.56 | 2.58 |
| 87 | 8.79 | 6.46 | 5.49 | 4.51 | 2.55 |
| 88 | 8.69 | 6.39 | 5.42 | 4.45 | 2.52 |
| 89 | 8.59 | 6.32 | 5.36 | 4.40 | 2.49 |
| 90 | 8.49 | 6.25 | 5.30 | 4.36 | 2.46 |
| 91 | 8.40 | 6.18 | 5.24 | 4.31 | 2.43 |
| 92 | 8.31 | 6.11 | 5.19 | 4.26 | 2.41 |
| 93 | 8.21 | 6.04 | 5.13 | 4.21 | 2.38 |
| 94 | 8.13 | 5.98 | 5.08 | 4.17 | 2.36 |
| 96 | 7.96 | 5.86 | 4.97 | 4.08 | 2.31 |
| 98 | 7.80 | 5.74 | 4.87 | 4.00 | 2.26 |
| 100 | 7.64 | 5.62 | 4.77 | 3.92 | 2.22 |
| 102 | 7.49 | 5.52 | 4.68 | 3.84 | 2.17 |
| 104 | 7.35 | 5.42 | 4.59 | 3.77 | 2.13 |
| 106 | 7.21 | 5.32 | 4.50 | 3.70 | 2.09 |
| 108 | 7.08 | 5.21 | 4.42 | 3.63 | 2.05 |
| 110 | 6.95 | 5.11 | 4.34 | 3.56 | 2.01 |
| Const's | 764.32 | 562.38 | 477.16 | 391.96 | 221.54 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll 1½ inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 4.20

Whirl 1⅝ inch Diameter

Front Roll Gear 100 Teeth

| Change | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|---------|---------------------|---------------------|---------------------|--------------------|--------------------|
| Gears | Twist | Twist | Twist | Twist | Twist |
| 15 | 41.00 | 30.17 | 25.59 | 21.02 | 11.88 |
| 16 | 38.44 | 28.28 | 24.00 | 19.71 | 11.14 |
| 17 | 36.17 | 26.62 | 22.58 | 18.55 | 10.49 |
| 18 | 34.17 | 25.14 | 21.33 | 17.52 | 9.90 |
| 19 | 32.37 | 23.81 | 20.21 | 16.60 | 9.38 |
| 20 | 30.75 | 22.62 | 19.20 | 15.77 | 8.91 |
| 21 | 29.28 | 21.55 | 18.28 | 15.02 | 8.49 |
| 22 | 27.95 | 20.57 | 17.45 | 14.34 | 8.10 |
| 23 | 26.74 | 19.67 | 16.69 | 13.71 | 7.76 |
| 24 | 25.62 | 18.85 | 16.00 | 13.14 | 7.43 |
| 25 | 24.60 | 18.10 | 15.36 | 12.61 | 7.13 |
| 26 | 23.65 | 17.40 | 14.77 | 12.13 | 6.86 |
| 27 | 22.78 | 16.76 | 14.22 | 11.68 | 6.60 |
| 28 | 21.96 | 16.16 | 13.71 | 11.26 | 6.37 |
| 29 | 21.21 | 15.60 | 13.24 | 10.87 | 6.15 |
| 30 | 20.50 | 15.08 | 12.80 | 10.51 | 5.94 |
| 31 | 19.84 | 14.60 | 12.38 | 10.17 | 5.75 |
| 32 | 19.22 | 14.14 | 12.00 | 9.86 | 5.57 |
| 33 | 18.64 | 13.71 | 11.63 | 9.56 | 5.40 |
| 34 | 18.09 | 13.31 | 11.29 | 9.28 | 5.24 |
| 35 | 17.57 | 12.93 | 10.97 | 9.01 | 5.09 |
| 36 | 17.08 | 12.57 | 10.66 | 8.76 | 4.95 |
| 37 | 16.62 | 12.23 | 10.38 | 8.52 | 4.82 |
| 38 | 16.18 | 11.91 | 10.10 | 8.30 | 4.69 |
| 39 | 15.77 | 11.60 | 9.84 | 8.09 | 4.57 |
| 40 | 15.37 | 11.31 | 9.60 | 7.88 | 4.46 |
| 41 | 15.00 | 11.04 | 9.36 | 7.69 | 4.35 |
| 42 | 14.64 | 10.77 | 9.14 | 7.51 | 4.24 |
| 43 | 14.30 | 10.52 | 8.93 | 7.33 | 4.15 |
| 44 | 13.98 | 10.28 | 8.73 | 7.17 | 4.05 |
| 45 | 13.67 | 10.06 | 8.53 | 7.01 | 3.96 |
| 46 | 13.37 | 9.84 | 8.35 | 6.86 | 3.88 |
| 47 | 13.08 | 9.63 | 8.17 | 6.71 | 3.79 |
| 48 | 12.81 | 9.43 | 8.00 | 6.57 | 3.71 |
| 49 | 12.55 | 9.23 | 7.84 | 6.44 | 3.64 |
| 50 | 12.30 | 9.05 | 7.68 | 6.31 | 3.57 |
| 51 | 12.06 | 8.87 | 7.53 | 6.18 | 3.50 |
| 52 | 11.83 | 8.70 | 7.38 | 6.06 | 3.43 |
| 53 | 11.60 | 8.54 | 7.24 | 5.95 | 3.36 |
| 54 | 11.39 | 8.38 | 7.11 | 5.84 | 3.30 |
| 55 | 11.18 | 8.23 | 6.98 | 5.73 | 3.24 |
| 56 | 10.98 | 8.08 | 6.86 | 5.63 | 3.18 |
| 57 | 10.79 | 7.94 | 6.74 | 5.53 | 3.13 |
| 58 | 10.60 | 7.80 | 6.62 | 5.44 | 3.07 |
| Const's | 614.97 | 452.48 | 383.92 | 315.37 | 178.25 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 4.20

Whirl $1\frac{5}{8}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 10.42 | 7.67 | 6.51 | 5.35 | 3.02 |
| 60 | 10.25 | 7.54 | 6.40 | 5.26 | 2.97 |
| 61 | 10.08 | 7.42 | 6.29 | 5.17 | 2.92 |
| 62 | 9.92 | 7.30 | 6.19 | 5.09 | 2.88 |
| 63 | 9.76 | 7.18 | 6.09 | 5.01 | 2.83 |
| 64 | 9.61 | 7.07 | 6.00 | 4.93 | 2.79 |
| 65 | 9.46 | 6.96 | 5.91 | 4.85 | 2.74 |
| 66 | 9.32 | 6.86 | 5.82 | 4.78 | 2.70 |
| 67 | 9.18 | 6.75 | 5.73 | 4.71 | 2.66 |
| 68 | 9.04 | 6.65 | 5.65 | 4.64 | 2.62 |
| 69 | 8.91 | 6.56 | 5.56 | 4.57 | 2.58 |
| 70 | 8.79 | 6.46 | 5.48 | 4.51 | 2.55 |
| 71 | 8.66 | 6.37 | 5.41 | 4.44 | 2.51 |
| 72 | 8.54 | 6.28 | 5.33 | 4.38 | 2.48 |
| 73 | 8.42 | 6.20 | 5.26 | 4.32 | 2.44 |
| 74 | 8.31 | 6.11 | 5.19 | 4.26 | 2.41 |
| 75 | 8.20 | 6.03 | 5.12 | 4.20 | 2.38 |
| 76 | 8.09 | 5.95 | 5.05 | 4.15 | 2.35 |
| 77 | 7.99 | 5.88 | 4.99 | 4.10 | 2.31 |
| 78 | 7.88 | 5.80 | 4.92 | 4.04 | 2.29 |
| 79 | 7.78 | 5.73 | 4.86 | 3.99 | 2.26 |
| 80 | 7.69 | 5.66 | 4.80 | 3.94 | 2.23 |
| 81 | 7.59 | 5.59 | 4.74 | 3.89 | 2.20 |
| 82 | 7.50 | 5.52 | 4.68 | 3.84 | 2.17 |
| 83 | 7.40 | 5.45 | 4.63 | 3.80 | 2.15 |
| 84 | 7.32 | 5.39 | 4.57 | 3.75 | 2.12 |
| 85 | 7.23 | 5.32 | 4.52 | 3.71 | 2.10 |
| 86 | 7.15 | 5.26 | 4.46 | 3.67 | 2.07 |
| 87 | 7.07 | 5.20 | 4.41 | 3.62 | 2.05 |
| 88 | 6.99 | 5.14 | 4.36 | 3.58 | 2.03 |
| 89 | 6.92 | 5.08 | 4.31 | 3.54 | 2.00 |
| 90 | 6.83 | 5.03 | 4.27 | 3.50 | 1.98 |
| 91 | 6.76 | 4.97 | 4.22 | 3.47 | 1.96 |
| 92 | 6.68 | 4.92 | 4.17 | 3.43 | 1.94 |
| 93 | 6.61 | 4.87 | 4.13 | 3.39 | 1.92 |
| 94 | 6.54 | 4.81 | 4.08 | 3.36 | 1.90 |
| 96 | 6.41 | 4.71 | 4.00 | 3.29 | 1.86 |
| 98 | 6.28 | 4.62 | 3.92 | 3.22 | 1.82 |
| 100 | 6.15 | 4.52 | 3.84 | 3.15 | 1.78 |
| 102 | 6.03 | 4.44 | 3.76 | 3.09 | 1.75 |
| 104 | 5.91 | 4.35 | 3.69 | 3.03 | 1.71 |
| 106 | 5.80 | 4.27 | 3.62 | 2.98 | 1.68 |
| 108 | 5.69 | 4.19 | 3.55 | 2.92 | 1.65 |
| 110 | 5.59 | 4.11 | 3.49 | 2.87 | 1.62 |
| Const's | 614.97 | 452.48 | 383.92 | 315.37 | 178.25 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 3.93

Whirl $1\frac{3}{4}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15 | 38.36 | 28.22 | 23.95 | 19.67 | 11.12 |
| 16 | 35.96 | 26.45 | 22.45 | 18.44 | 10.42 |
| 17 | 33.85 | 24.90 | 21.13 | 17.36 | 9.81 |
| 18 | 31.96 | 23.52 | 19.96 | 16.39 | 9.26 |
| 19 | 30.29 | 22.28 | 18.91 | 15.53 | 8.78 |
| 20 | 28.77 | 21.17 | 17.96 | 14.76 | 8.34 |
| 21 | 27.40 | 20.16 | 17.11 | 14.05 | 7.94 |
| 22 | 26.16 | 19.24 | 16.33 | 13.41 | 7.58 |
| 23 | 25.02 | 18.40 | 15.62 | 12.83 | 7.25 |
| 24 | 23.98 | 17.64 | 14.97 | 12.30 | 6.95 |
| 25 | 23.02 | 16.93 | 14.37 | 11.80 | 6.67 |
| 26 | 22.13 | 16.28 | 13.82 | 11.35 | 6.41 |
| 27 | 21.31 | 15.68 | 13.31 | 10.93 | 6.18 |
| 28 | 20.55 | 15.12 | 12.83 | 10.54 | 5.96 |
| 29 | 19.84 | 14.60 | 12.39 | 10.18 | 5.75 |
| 30 | 19.18 | 14.11 | 11.98 | 9.84 | 5.56 |
| 31 | 18.56 | 13.66 | 11.59 | 9.52 | 5.38 |
| 32 | 17.98 | 13.23 | 11.23 | 9.22 | 5.21 |
| 33 | 17.44 | 12.83 | 10.89 | 8.94 | 5.05 |
| 34 | 16.92 | 12.45 | 10.57 | 8.68 | 4.91 |
| 35 | 16.44 | 12.09 | 10.26 | 8.43 | 4.77 |
| 36 | 15.98 | 11.76 | 9.98 | 8.20 | 4.63 |
| 37 | 15.55 | 11.44 | 9.71 | 7.98 | 4.51 |
| 38 | 15.14 | 11.14 | 9.45 | 7.77 | 4.39 |
| 39 | 14.75 | 10.85 | 9.21 | 7.57 | 4.28 |
| 40 | 14.39 | 10.58 | 8.98 | 7.38 | 4.17 |
| 41 | 14.04 | 10.33 | 8.76 | 7.20 | 4.07 |
| 42 | 13.70 | 10.08 | 8.55 | 7.03 | 3.97 |
| 43 | 13.38 | 9.84 | 8.35 | 6.86 | 3.88 |
| 44 | 13.08 | 9.62 | 8.16 | 6.71 | 3.79 |
| 45 | 12.79 | 9.41 | 7.98 | 6.56 | 3.71 |
| 46 | 12.51 | 9.20 | 7.81 | 6.42 | 3.63 |
| 47 | 12.24 | 9.01 | 7.64 | 6.28 | 3.55 |
| 48 | 11.99 | 8.82 | 7.48 | 6.15 | 3.47 |
| 49 | 11.74 | 8.64 | 7.33 | 6.02 | 3.40 |
| 50 | 11.51 | 8.47 | 7.19 | 5.90 | 3.33 |
| 51 | 11.28 | 8.30 | 7.04 | 5.79 | 3.27 |
| 52 | 11.07 | 8.14 | 6.91 | 5.68 | 3.21 |
| 53 | 10.86 | 7.99 | 6.78 | 5.57 | 3.15 |
| 54 | 10.66 | 7.84 | 6.65 | 5.46 | 3.08 |
| 55 | 10.46 | 7.70 | 6.53 | 5.36 | 3.03 |
| 56 | 10.28 | 7.56 | 6.42 | 5.27 | 2.98 |
| 57 | 10.10 | 7.43 | 6.30 | 5.18 | 2.93 |
| 58 | 9.92 | 7.30 | 6.19 | 5.09 | 2.88 |
| Const's | 575.44 | 423.31 | 359.24 | 295.10 | 166.78 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll 1½ inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 3.93

Whirl 1¼ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 9.75 | 7.17 | 6.09 | 5.00 | 2.83 |
| 60 | 9.59 | 7.06 | 5.99 | 4.92 | 2.78 |
| 61 | 9.43 | 6.94 | 5.89 | 4.84 | 2.73 |
| 62 | 9.28 | 6.83 | 5.79 | 4.76 | 2.69 |
| 63 | 9.13 | 6.72 | 5.70 | 4.68 | 2.64 |
| 64 | 8.99 | 6.61 | 5.61 | 4.61 | 2.61 |
| 65 | 8.85 | 6.51 | 5.53 | 4.54 | 2.57 |
| 66 | 8.72 | 6.41 | 5.44 | 4.47 | 2.52 |
| 67 | 8.59 | 6.31 | 5.36 | 4.40 | 2.49 |
| 68 | 8.46 | 6.23 | 5.28 | 4.34 | 2.45 |
| 69 | 8.34 | 6.13 | 5.21 | 4.28 | 2.42 |
| 70 | 8.22 | 6.05 | 5.13 | 4.22 | 2.38 |
| 71 | 8.10 | 5.96 | 5.06 | 4.16 | 2.35 |
| 72 | 7.99 | 5.88 | 4.99 | 4.10 | 2.32 |
| 73 | 7.88 | 5.80 | 4.92 | 4.04 | 2.28 |
| 74 | 7.78 | 5.72 | 4.85 | 3.99 | 2.25 |
| 75 | 7.67 | 5.64 | 4.78 | 3.93 | 2.22 |
| 76 | 7.57 | 5.57 | 4.73 | 3.88 | 2.20 |
| 77 | 7.47 | 5.50 | 4.67 | 3.83 | 2.17 |
| 78 | 7.38 | 5.43 | 4.61 | 3.78 | 2.14 |
| 79 | 7.28 | 5.36 | 4.55 | 3.74 | 2.11 |
| 80 | 7.19 | 5.29 | 4.49 | 3.69 | 2.08 |
| 81 | 7.10 | 5.23 | 4.44 | 3.64 | 2.06 |
| 82 | 7.02 | 5.16 | 4.38 | 3.60 | 2.03 |
| 83 | 6.93 | 5.10 | 4.33 | 3.56 | 2.01 |
| 84 | 6.85 | 5.04 | 4.28 | 3.51 | 1.99 |
| 85 | 6.77 | 4.98 | 4.23 | 3.47 | 1.96 |
| 86 | 6.69 | 4.92 | 4.18 | 3.43 | 1.94 |
| 87 | 6.61 | 4.87 | 4.12 | 3.39 | 1.92 |
| 88 | 6.54 | 4.81 | 4.08 | 3.35 | 1.90 |
| 89 | 6.47 | 4.76 | 4.04 | 3.32 | 1.87 |
| 90 | 6.39 | 4.70 | 3.99 | 3.28 | 1.85 |
| 91 | 6.32 | 4.65 | 3.95 | 3.24 | 1.83 |
| 92 | 6.25 | 4.60 | 3.90 | 3.21 | 1.81 |
| 93 | 6.19 | 4.55 | 3.86 | 3.17 | 1.79 |
| 94 | 6.12 | 4.50 | 3.81 | 3.14 | 1.77 |
| 96 | 5.99 | 4.41 | 3.74 | 3.07 | 1.74 |
| 98 | 5.87 | 4.32 | 3.67 | 3.01 | 1.70 |
| 100 | 5.75 | 4.23 | 3.59 | 2.95 | 1.66 |
| 102 | 5.64 | 4.15 | 3.52 | 2.89 | 1.64 |
| 104 | 5.53 | 4.07 | 3.45 | 2.84 | 1.60 |
| 106 | 5.43 | 3.99 | 3.39 | 2.78 | 1.57 |
| 108 | 5.33 | 3.92 | 3.33 | 2.73 | 1.54 |
| 110 | 5.23 | 3.85 | 3.27 | 2.68 | 1.52 |
| Const's | 575.44 | 423.31 | 359.24 | 295.10 | 166.78 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll 1½ inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 3.51

Whirl 2 inches Diameter

Front Roll Gear 100 Teeth

| Change | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|---------|---------------------|---------------------|---------------------|--------------------|--------------------|
| Gears | Twist | Twist | Twist | Twist | Twist |
| 15 | 34.26 | 25.21 | 21.39 | 17.57 | 9.93 |
| 16 | 32.12 | 23.63 | 20.05 | 16.47 | 9.31 |
| 17 | 30.23 | 22.24 | 18.87 | 15.50 | 8.76 |
| 18 | 28.55 | 21.01 | 17.83 | 14.64 | 8.28 |
| 19 | 27.05 | 19.90 | 16.89 | 13.87 | 7.84 |
| 20 | 25.70 | 18.91 | 16.04 | 13.18 | 7.45 |
| 21 | 24.47 | 18.01 | 15.28 | 12.55 | 7.09 |
| 22 | 23.36 | 17.19 | 14.58 | 11.98 | 6.77 |
| 23 | 22.35 | 16.44 | 13.95 | 11.46 | 6.48 |
| 24 | 21.41 | 15.76 | 13.37 | 10.98 | 6.21 |
| 25 | 20.56 | 15.13 | 12.83 | 10.54 | 5.96 |
| 26 | 19.77 | 14.54 | 12.34 | 10.14 | 5.73 |
| 27 | 19.03 | 14.01 | 11.88 | 9.76 | 5.52 |
| 28 | 18.36 | 13.51 | 11.46 | 9.41 | 5.32 |
| 29 | 17.72 | 13.04 | 11.06 | 9.09 | 5.14 |
| 30 | 17.13 | 12.61 | 10.70 | 8.79 | 4.97 |
| 31 | 16.58 | 12.20 | 10.35 | 8.50 | 4.81 |
| 32 | 16.06 | 11.82 | 10.03 | 8.24 | 4.66 |
| 33 | 15.57 | 11.46 | 9.72 | 7.99 | 4.51 |
| 34 | 15.12 | 11.12 | 9.44 | 7.75 | 4.38 |
| 35 | 14.68 | 10.80 | 9.17 | 7.53 | 4.26 |
| 36 | 14.28 | 10.50 | 8.91 | 7.32 | 4.14 |
| 37 | 13.89 | 10.22 | 8.67 | 7.12 | 4.03 |
| 38 | 13.52 | 9.95 | 8.44 | 6.94 | 3.92 |
| 39 | 13.18 | 9.70 | 8.23 | 6.76 | 3.82 |
| 40 | 12.85 | 9.45 | 8.02 | 6.59 | 3.72 |
| 41 | 12.54 | 9.22 | 7.83 | 6.43 | 3.63 |
| 42 | 12.24 | 9.00 | 7.64 | 6.28 | 3.55 |
| 43 | 11.95 | 8.79 | 7.46 | 6.13 | 3.46 |
| 44 | 11.68 | 8.59 | 7.29 | 5.99 | 3.39 |
| 45 | 11.42 | 8.40 | 7.13 | 5.86 | 3.31 |
| 46 | 11.17 | 8.22 | 6.98 | 5.73 | 3.24 |
| 47 | 10.93 | 8.05 | 6.83 | 5.61 | 3.17 |
| 48 | 10.71 | 7.88 | 6.68 | 5.49 | 3.10 |
| 49 | 10.49 | 7.71 | 6.55 | 5.38 | 3.04 |
| 50 | 10.28 | 7.56 | 6.42 | 5.27 | 2.98 |
| 51 | 10.08 | 7.41 | 6.29 | 5.17 | 2.92 |
| 52 | 9.88 | 7.27 | 6.17 | 5.07 | 2.86 |
| 53 | 9.70 | 7.13 | 6.05 | 4.97 | 2.81 |
| 54 | 9.52 | 7.00 | 5.94 | 4.88 | 2.76 |
| 55 | 9.34 | 6.88 | 5.83 | 4.79 | 2.71 |
| 56 | 9.18 | 6.75 | 5.73 | 4.71 | 2.66 |
| 57 | 9.02 | 6.63 | 5.63 | 4.62 | 2.61 |
| 58 | 8.86 | 6.52 | 5.53 | 4.54 | 2.57 |
| Const's | 513.94 | 378.15 | 320.86 | 263.56 | 148.96 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 3.51

Whirl 2 inches Diameter

Front Roll Gear 100 Teeth

| Change | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|---------|---------------------|---------------------|---------------------|--------------------|--------------------|
| Gears | Twist | Twist | Twist | Twist | Twist |
| 59 | 8.71 | 6.41 | 5.44 | 4.47 | 2.52 |
| 60 | 8.57 | 6.30 | 5.35 | 4.39 | 2.48 |
| 61 | 8.43 | 6.20 | 5.26 | 4.32 | 2.44 |
| 62 | 8.29 | 6.10 | 5.18 | 4.25 | 2.40 |
| 63 | 8.16 | 6.00 | 5.09 | 4.18 | 2.36 |
| 64 | 8.03 | 5.91 | 5.01 | 4.12 | 2.33 |
| 65 | 7.91 | 5.82 | 4.94 | 4.05 | 2.29 |
| 66 | 7.79 | 5.73 | 4.86 | 3.99 | 2.26 |
| 67 | 7.67 | 5.64 | 4.79 | 3.93 | 2.22 |
| 68 | 7.56 | 5.56 | 4.72 | 3.88 | 2.19 |
| 69 | 7.45 | 5.48 | 4.65 | 3.82 | 2.16 |
| 70 | 7.34 | 5.40 | 4.58 | 3.77 | 2.13 |
| 71 | 7.23 | 5.33 | 4.52 | 3.71 | 2.10 |
| 72 | 7.14 | 5.25 | 4.46 | 3.66 | 2.07 |
| 73 | 7.04 | 5.18 | 4.40 | 3.62 | 2.04 |
| 74 | 6.94 | 5.11 | 4.34 | 3.56 | 2.01 |
| 75 | 6.85 | 5.04 | 4.28 | 3.51 | 1.99 |
| 76 | 6.76 | 4.98 | 4.22 | 3.47 | 1.96 |
| 77 | 6.67 | 4.91 | 4.17 | 3.42 | 1.93 |
| 78 | 6.59 | 4.85 | 4.11 | 3.38 | 1.91 |
| 79 | 6.51 | 4.79 | 4.06 | 3.34 | 1.89 |
| 80 | 6.42 | 4.73 | 4.01 | 3.29 | 1.86 |
| 81 | 6.34 | 4.67 | 3.96 | 3.25 | 1.84 |
| 82 | 6.27 | 4.61 | 3.91 | 3.21 | 1.82 |
| 83 | 6.19 | 4.56 | 3.87 | 3.18 | 1.79 |
| 84 | 6.12 | 4.50 | 3.82 | 3.14 | 1.77 |
| 85 | 6.05 | 4.45 | 3.77 | 3.10 | 1.75 |
| 86 | 5.98 | 4.40 | 3.73 | 3.06 | 1.73 |
| 87 | 5.91 | 4.35 | 3.69 | 3.03 | 1.71 |
| 88 | 5.84 | 4.30 | 3.65 | 3.00 | 1.69 |
| 89 | 5.77 | 4.25 | 3.61 | 2.96 | 1.67 |
| 90 | 5.71 | 4.20 | 3.57 | 2.93 | 1.66 |
| 91 | 5.65 | 4.16 | 3.53 | 2.90 | 1.64 |
| 92 | 5.59 | 4.11 | 3.49 | 2.87 | 1.62 |
| 93 | 5.53 | 4.07 | 3.45 | 2.83 | 1.60 |
| 94 | 5.47 | 4.02 | 3.41 | 2.80 | 1.58 |
| 96 | 5.35 | 3.94 | 3.34 | 2.74 | 1.55 |
| 98 | 5.24 | 3.86 | 3.27 | 2.69 | 1.50 |
| 100 | 5.14 | 3.78 | 3.21 | 2.64 | 1.47 |
| 102 | 5.04 | 3.71 | 3.15 | 2.58 | 1.45 |
| 104 | 4.94 | 3.64 | 3.09 | 2.53 | 1.42 |
| 106 | 4.85 | 3.57 | 3.03 | 2.49 | 1.39 |
| 108 | 4.76 | 3.50 | 2.97 | 2.44 | 1.37 |
| 110 | 4.67 | 3.44 | 2.92 | 2.40 | 1.35 |
| Const's | 513.94 | 378.15 | 320.86 | 263.56 | 148.96 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 2.76

Whirl $2\frac{1}{2}$ inches Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15 | 26.94 | 19.82 | 16.82 | 13.82 | 7.81 |
| 16 | 25.26 | 18.58 | 15.77 | 12.95 | 7.32 |
| 17 | 23.77 | 17.49 | 14.84 | 12.19 | 6.89 |
| 18 | 22.45 | 16.52 | 14.02 | 11.51 | 6.51 |
| 19 | 21.27 | 15.65 | 13.28 | 10.91 | 6.17 |
| 20 | 20.21 | 14.87 | 12.61 | 10.36 | 5.86 |
| 21 | 19.24 | 14.16 | 12.01 | 9.87 | 5.58 |
| 22 | 18.37 | 13.52 | 11.47 | 9.42 | 5.32 |
| 23 | 17.57 | 12.93 | 10.97 | 9.01 | 5.09 |
| 24 | 16.84 | 12.39 | 10.51 | 8.64 | 4.88 |
| 25 | 16.16 | 11.89 | 10.09 | 8.29 | 4.69 |
| 26 | 15.54 | 11.44 | 9.70 | 7.97 | 4.51 |
| 27 | 14.97 | 11.01 | 9.34 | 7.68 | 4.34 |
| 28 | 14.43 | 10.62 | 9.01 | 7.40 | 4.18 |
| 29 | 13.94 | 10.25 | 8.70 | 7.15 | 4.03 |
| 30 | 13.47 | 9.91 | 8.41 | 6.91 | 3.91 |
| 31 | 13.04 | 9.59 | 8.14 | 6.69 | 3.78 |
| 32 | 12.63 | 9.29 | 7.88 | 6.48 | 3.66 |
| 33 | 12.25 | 9.01 | 7.65 | 6.28 | 3.55 |
| 34 | 11.89 | 8.75 | 7.42 | 6.10 | 3.45 |
| 35 | 11.55 | 8.50 | 7.21 | 5.92 | 3.35 |
| 36 | 11.23 | 8.26 | 7.01 | 5.76 | 3.25 |
| 37 | 10.92 | 8.04 | 6.82 | 5.60 | 3.16 |
| 38 | 10.64 | 7.83 | 6.64 | 5.45 | 3.08 |
| 39 | 10.36 | 7.62 | 6.47 | 5.31 | 3.00 |
| 40 | 10.10 | 7.43 | 6.31 | 5.18 | 2.93 |
| 41 | 9.86 | 7.25 | 6.15 | 5.05 | 2.86 |
| 42 | 9.62 | 7.08 | 6.01 | 4.93 | 2.79 |
| 43 | 9.40 | 6.92 | 5.87 | 4.82 | 2.72 |
| 44 | 9.18 | 6.76 | 5.73 | 4.71 | 2.66 |
| 45 | 8.98 | 6.61 | 5.61 | 4.61 | 2.60 |
| 46 | 8.79 | 6.46 | 5.48 | 4.51 | 2.55 |
| 47 | 8.60 | 6.33 | 5.37 | 4.41 | 2.49 |
| 48 | 8.42 | 6.19 | 5.26 | 4.32 | 2.44 |
| 49 | 8.25 | 6.08 | 5.15 | 4.23 | 2.39 |
| 50 | 8.08 | 5.95 | 5.05 | 4.15 | 2.34 |
| 51 | 7.92 | 5.83 | 4.95 | 4.06 | 2.30 |
| 52 | 7.77 | 5.72 | 4.85 | 3.99 | 2.25 |
| 53 | 7.63 | 5.61 | 4.76 | 3.91 | 2.21 |
| 54 | 7.48 | 5.51 | 4.67 | 3.84 | 2.17 |
| 55 | 7.35 | 5.41 | 4.59 | 3.77 | 2.13 |
| 56 | 7.22 | 5.31 | 4.51 | 3.70 | 2.09 |
| 57 | 7.09 | 5.22 | 4.43 | 3.64 | 2.06 |
| 58 | 6.97 | 5.13 | 4.35 | 3.57 | 2.02 |
| Const's | 404.12 | 297.35 | 252.29 | 207.24 | 117.14 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll 1½ inch Diameter

Cylinder 7 inches Diameter

Ratio Cylinder to Whirl 1 to 2.76

Whirl 2½ inches Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 6.85 | 5.04 | 4.28 | 3.51 | 1.99 |
| 60 | 6.74 | 4.96 | 4.21 | 3.45 | 1.95 |
| 61 | 6.63 | 4.87 | 4.14 | 3.40 | 1.92 |
| 62 | 6.52 | 4.80 | 4.07 | 3.34 | 1.89 |
| 63 | 6.42 | 4.72 | 4.00 | 3.29 | 1.86 |
| 64 | 6.31 | 4.65 | 3.94 | 3.24 | 1.83 |
| 65 | 6.22 | 4.57 | 3.88 | 3.19 | 1.80 |
| 66 | 6.12 | 4.51 | 3.82 | 3.14 | 1.77 |
| 67 | 6.03 | 4.44 | 3.77 | 3.09 | 1.75 |
| 68 | 5.94 | 4.37 | 3.71 | 3.05 | 1.72 |
| 69 | 5.86 | 4.31 | 3.65 | 3.00 | 1.70 |
| 70 | 5.77 | 4.25 | 3.60 | 2.96 | 1.67 |
| 71 | 5.69 | 4.19 | 3.55 | 2.92 | 1.65 |
| 72 | 5.61 | 4.13 | 3.50 | 2.88 | 1.63 |
| 73 | 5.54 | 4.07 | 3.46 | 2.84 | 1.60 |
| 74 | 5.46 | 4.02 | 3.41 | 2.80 | 1.58 |
| 75 | 5.39 | 3.96 | 3.36 | 2.76 | 1.56 |
| 76 | 5.32 | 3.91 | 3.32 | 2.73 | 1.54 |
| 77 | 5.25 | 3.86 | 3.28 | 2.69 | 1.52 |
| 78 | 5.18 | 3.81 | 3.23 | 2.66 | 1.50 |
| 79 | 5.12 | 3.76 | 3.19 | 2.62 | 1.48 |
| 80 | 5.05 | 3.72 | 3.15 | 2.59 | 1.46 |
| 81 | 4.99 | 3.67 | 3.11 | 2.56 | 1.45 |
| 82 | 4.93 | 3.63 | 3.08 | 2.53 | 1.43 |
| 83 | 4.87 | 3.58 | 3.04 | 2.50 | 1.41 |
| 84 | 4.81 | 3.54 | 3.00 | 2.47 | 1.39 |
| 85 | 4.75 | 3.50 | 2.97 | 2.43 | 1.38 |
| 86 | 4.70 | 3.46 | 2.93 | 2.41 | 1.36 |
| 87 | 4.65 | 3.42 | 2.90 | 2.38 | 1.35 |
| 88 | 4.59 | 3.38 | 2.87 | 2.36 | 1.33 |
| 89 | 4.54 | 3.34 | 2.83 | 2.33 | 1.32 |
| 90 | 4.49 | 3.30 | 2.80 | 2.30 | 1.30 |
| 91 | 4.44 | 3.27 | 2.77 | 2.28 | 1.29 |
| 92 | 4.39 | 3.23 | 2.74 | 2.25 | 1.27 |
| 93 | 4.35 | 3.20 | 2.71 | 2.23 | 1.26 |
| 94 | 4.30 | 3.16 | 2.68 | 2.20 | 1.25 |
| 96 | 4.21 | 3.10 | 2.63 | 2.16 | 1.22 |
| 98 | 4.12 | 3.03 | 2.57 | 2.11 | 1.20 |
| 100 | 4.04 | 2.97 | 2.52 | 2.07 | 1.17 |
| 102 | 3.96 | 2.91 | 2.47 | 2.03 | 1.15 |
| 104 | 3.88 | 2.86 | 2.43 | 1.99 | 1.13 |
| 106 | 3.81 | 2.80 | 2.38 | 1.96 | 1.10 |
| 108 | 3.74 | 2.75 | 2.34 | 1.92 | 1.08 |
| 110 | 3.67 | 2.70 | 2.29 | 1.88 | 1.06 |
| Const's | 404.12 | 297.35 | 252.29 | 207.24 | 117.14 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 8.80

Whirl $\frac{7}{8}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15 | 85.90 | 63.20 | 53.65 | 44.05 | 24.89 |
| 16 | 80.53 | 59.25 | 50.27 | 41.29 | 23.34 |
| 17 | 75.76 | 55.77 | 47.32 | 38.87 | 21.97 |
| 18 | 71.58 | 52.67 | 44.69 | 36.71 | 20.75 |
| 19 | 67.82 | 49.89 | 42.34 | 34.78 | 19.66 |
| 20 | 64.43 | 47.40 | 40.22 | 33.04 | 18.67 |
| 21 | 61.36 | 45.14 | 38.31 | 31.46 | 17.78 |
| 22 | 58.57 | 43.09 | 36.56 | 30.13 | 16.98 |
| 23 | 56.03 | 41.22 | 34.97 | 28.73 | 16.24 |
| 24 | 53.69 | 39.50 | 33.52 | 27.53 | 15.56 |
| 25 | 51.54 | 37.96 | 32.18 | 26.43 | 14.94 |
| 26 | 49.56 | 36.47 | 30.94 | 25.41 | 14.36 |
| 27 | 47.73 | 35.11 | 29.79 | 24.47 | 13.83 |
| 28 | 46.02 | 33.86 | 28.73 | 23.59 | 13.34 |
| 29 | 44.43 | 32.69 | 27.74 | 22.78 | 12.88 |
| 30 | 42.95 | 31.60 | 26.82 | 22.02 | 12.45 |
| 31 | 41.56 | 30.58 | 25.95 | 21.31 | 12.04 |
| 32 | 40.26 | 29.63 | 25.13 | 20.64 | 11.67 |
| 33 | 39.05 | 28.73 | 24.38 | 20.03 | 11.32 |
| 34 | 37.89 | 27.88 | 23.66 | 19.43 | 10.98 |
| 35 | 36.81 | 27.09 | 22.98 | 18.88 | 10.67 |
| 36 | 35.79 | 26.34 | 22.34 | 18.35 | 10.37 |
| 37 | 34.82 | 25.62 | 21.74 | 17.86 | 10.09 |
| 38 | 33.91 | 24.94 | 21.17 | 17.39 | 9.83 |
| 39 | 33.04 | 24.31 | 20.63 | 16.94 | 9.58 |
| 40 | 32.21 | 23.70 | 20.11 | 16.52 | 9.32 |
| 41 | 31.43 | 23.12 | 19.64 | 16.11 | 9.18 |
| 42 | 30.68 | 22.52 | 19.15 | 15.73 | 8.89 |
| 43 | 29.96 | 22.05 | 18.71 | 15.36 | 8.68 |
| 44 | 29.28 | 21.54 | 18.28 | 15.01 | 8.49 |
| 45 | 28.63 | 21.06 | 17.88 | 14.68 | 8.29 |
| 46 | 28.01 | 20.61 | 17.48 | 14.36 | 8.12 |
| 47 | 27.42 | 20.17 | 17.12 | 14.06 | 7.94 |
| 48 | 26.84 | 19.75 | 16.76 | 13.76 | 7.73 |
| 49 | 26.29 | 19.35 | 16.42 | 13.48 | 7.62 |
| 50 | 25.77 | 18.98 | 16.09 | 13.21 | 7.47 |
| 51 | 25.27 | 18.59 | 15.77 | 12.95 | 7.32 |
| 52 | 24.78 | 18.23 | 15.47 | 12.70 | 7.18 |
| 53 | 24.31 | 17.84 | 15.18 | 12.47 | 7.05 |
| 54 | 23.86 | 17.55 | 14.89 | 12.23 | 6.91 |
| 55 | 23.43 | 17.23 | 14.63 | 12.01 | 6.79 |
| 56 | 23.01 | 16.93 | 14.36 | 11.79 | 6.67 |
| 57 | 22.61 | 16.63 | 14.11 | 11.59 | 6.55 |
| 58 | 22.22 | 16.34 | 13.87 | 11.39 | 6.44 |
| Cons'ts | 1288.51 | 948.07 | 804.42 | 660.77 | 373.48 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll 1½ inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 8.80

Whirl ⅞ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 21.84 | 16.07 | 13.64 | 11.19 | 6.33 |
| 60 | 21.47 | 15.80 | 13.41 | 11.02 | 6.22 |
| 61 | 21.12 | 15.54 | 13.18 | 10.83 | 6.12 |
| 62 | 20.78 | 15.29 | 12.97 | 10.65 | 6.02 |
| 63 | 20.45 | 15.05 | 12.77 | 10.48 | 5.93 |
| 64 | 20.13 | 14.81 | 12.56 | 10.32 | 5.83 |
| 65 | 19.83 | 14.58 | 12.38 | 10.16 | 5.74 |
| 66 | 19.52 | 14.36 | 12.19 | 10.01 | 5.66 |
| 67 | 19.23 | 14.15 | 12.01 | 9.86 | 5.57 |
| 68 | 18.94 | 13.94 | 11.83 | 9.71 | 5.49 |
| 69 | 18.67 | 13.74 | 11.66 | 9.57 | 5.41 |
| 70 | 18.40 | 13.54 | 11.49 | 9.44 | 5.33 |
| 71 | 18.15 | 13.35 | 11.33 | 9.31 | 5.26 |
| 72 | 17.89 | 13.17 | 11.17 | 9.17 | 5.19 |
| 73 | 17.65 | 12.99 | 11.02 | 9.05 | 5.12 |
| 74 | 17.41 | 12.81 | 10.87 | 8.93 | 5.04 |
| 75 | 17.18 | 12.64 | 10.73 | 8.81 | 4.98 |
| 76 | 16.96 | 12.47 | 10.58 | 8.69 | 4.91 |
| 77 | 16.73 | 12.31 | 10.44 | 8.58 | 4.85 |
| 78 | 16.52 | 12.15 | 10.31 | 8.47 | 4.79 |
| 79 | 16.31 | 12.00 | 10.18 | 8.36 | 4.73 |
| 80 | 16.10 | 11.85 | 10.05 | 8.26 | 4.66 |
| 81 | 15.91 | 11.70 | 9.91 | 8.15 | 4.61 |
| 82 | 15.72 | 11.56 | 9.82 | 8.05 | 4.59 |
| 83 | 15.53 | 11.44 | 9.69 | 7.96 | 4.49 |
| 84 | 15.34 | 11.26 | 9.57 | 7.86 | 4.45 |
| 85 | 15.16 | 11.15 | 9.46 | 7.77 | 4.39 |
| 86 | 14.98 | 11.02 | 9.35 | 7.68 | 4.34 |
| 87 | 14.81 | 10.89 | 9.24 | 7.59 | 4.29 |
| 88 | 14.64 | 10.77 | 9.14 | 7.50 | 4.24 |
| 89 | 14.48 | 10.65 | 9.04 | 7.42 | 4.19 |
| 90 | 14.31 | 10.53 | 8.94 | 7.34 | 4.14 |
| 91 | 14.16 | 10.42 | 8.84 | 7.26 | 4.10 |
| 92 | 14.01 | 10.30 | 8.74 | 7.18 | 4.06 |
| 93 | 13.85 | 10.19 | 8.65 | 7.11 | 4.01 |
| 94 | 13.71 | 10.08 | 8.56 | 7.03 | 3.97 |
| 96 | 13.42 | 9.87 | 8.38 | 6.88 | 3.89 |
| 98 | 13.14 | 9.67 | 8.21 | 6.74 | 3.81 |
| 100 | 12.89 | 9.48 | 8.04 | 6.61 | 3.73 |
| 102 | 12.63 | 9.29 | 7.88 | 6.47 | 3.66 |
| 104 | 12.39 | 9.11 | 7.73 | 6.35 | 3.59 |
| 106 | 12.15 | 8.94 | 7.54 | 6.23 | 3.52 |
| 108 | 11.93 | 8.78 | 7.45 | 6.11 | 3.45 |
| 110 | 11.71 | 8.62 | 7.31 | 6.01 | 3.39 |
| Cons'ts | 1288.51 | 948.07 | 804.42 | 660.77 | 373.48 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 8 inches Diameter Ratio Cylinder to Whirl 1 to 8.30
 Whirl $\frac{15}{16}$ inch Diameter Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15 | 79.06 | 58.17 | 49.36 | 40.51 | 22.91 |
| 16 | 74.12 | 54.54 | 46.27 | 38.01 | 21.48 |
| 17 | 69.76 | 51.33 | 43.55 | 35.77 | 20.22 |
| 18 | 65.89 | 48.48 | 41.13 | 33.78 | 19.09 |
| 19 | 62.42 | 45.92 | 38.97 | 32.01 | 18.09 |
| 20 | 59.30 | 43.63 | 37.02 | 30.41 | 17.18 |
| 21 | 56.47 | 41.55 | 35.24 | 28.96 | 16.37 |
| 22 | 53.90 | 39.66 | 33.65 | 27.64 | 15.62 |
| 23 | 51.56 | 37.94 | 32.19 | 26.44 | 14.94 |
| 24 | 49.41 | 36.36 | 30.85 | 25.34 | 14.32 |
| 25 | 47.44 | 34.90 | 29.61 | 24.32 | 13.75 |
| 26 | 45.62 | 33.56 | 28.47 | 23.39 | 13.22 |
| 27 | 43.92 | 32.32 | 27.42 | 22.52 | 12.73 |
| 28 | 42.35 | 31.16 | 26.44 | 21.72 | 12.27 |
| 29 | 40.89 | 30.09 | 25.53 | 20.97 | 11.85 |
| 30 | 39.53 | 29.08 | 24.68 | 20.27 | 11.45 |
| 31 | 38.25 | 28.15 | 23.88 | 19.29 | 11.08 |
| 32 | 37.06 | 27.24 | 23.13 | 19.00 | 10.74 |
| 33 | 35.94 | 26.44 | 22.43 | 18.43 | 10.41 |
| 34 | 34.88 | 25.66 | 21.80 | 17.88 | 10.11 |
| 35 | 33.88 | 24.91 | 21.15 | 17.37 | 9.82 |
| 36 | 32.94 | 24.24 | 20.56 | 16.89 | 9.54 |
| 37 | 32.05 | 23.58 | 20.01 | 16.43 | 9.29 |
| 38 | 31.21 | 22.96 | 19.43 | 16.00 | 9.04 |
| 39 | 30.41 | 22.37 | 18.98 | 15.59 | 8.81 |
| 40 | 29.65 | 21.81 | 18.51 | 15.20 | 8.59 |
| 41 | 28.92 | 21.28 | 18.07 | 14.81 | 8.38 |
| 42 | 28.23 | 20.77 | 17.62 | 14.47 | 8.18 |
| 43 | 27.58 | 20.29 | 17.21 | 14.14 | 7.99 |
| 44 | 26.95 | 19.83 | 16.82 | 13.82 | 7.81 |
| 45 | 26.35 | 19.39 | 16.45 | 13.51 | 7.63 |
| 46 | 25.78 | 18.97 | 16.09 | 13.22 | 7.47 |
| 47 | 25.23 | 18.56 | 15.75 | 12.94 | 7.31 |
| 48 | 24.60 | 18.18 | 15.42 | 12.67 | 7.16 |
| 49 | 24.20 | 17.80 | 15.11 | 12.41 | 7.01 |
| 50 | 23.72 | 17.45 | 14.80 | 12.16 | 6.87 |
| 51 | 23.25 | 17.11 | 14.51 | 11.92 | 6.73 |
| 52 | 22.80 | 16.78 | 14.23 | 11.68 | 6.61 |
| 53 | 22.37 | 16.46 | 13.97 | 11.48 | 6.48 |
| 54 | 21.96 | 16.16 | 13.71 | 11.26 | 6.36 |
| 55 | 21.56 | 15.86 | 13.46 | 11.05 | 6.25 |
| 56 | 21.17 | 15.58 | 13.22 | 10.86 | 6.13 |
| 57 | 20.80 | 15.31 | 12.99 | 10.67 | 6.03 |
| 58 | 20.45 | 15.04 | 12.76 | 10.49 | 5.92 |
| Cons'ts | 1186.02 | 872.65 | 740.43 | 608.21 | 343.77 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 8.30

Whirl $\frac{15}{16}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 20.10 | 14.80 | 12.54 | 10.30 | 5.82 |
| 60 | 19.76 | 14.54 | 12.34 | 10.13 | 5.72 |
| 61 | 19.44 | 14.30 | 12.13 | 9.96 | 5.63 |
| 62 | 19.12 | 14.07 | 11.94 | 9.81 | 5.54 |
| 63 | 18.81 | 13.85 | 11.75 | 9.65 | 5.45 |
| 64 | 18.52 | 13.63 | 11.56 | 9.50 | 5.37 |
| 65 | 18.23 | 13.42 | 11.39 | 9.35 | 5.28 |
| 66 | 17.97 | 13.22 | 11.21 | 9.21 | 5.20 |
| 67 | 17.70 | 13.02 | 11.05 | 9.07 | 5.13 |
| 68 | 17.44 | 12.83 | 10.88 | 8.94 | 5.05 |
| 69 | 17.19 | 12.64 | 10.73 | 8.81 | 4.98 |
| 70 | 16.94 | 12.46 | 10.57 | 8.68 | 4.91 |
| 71 | 16.70 | 12.29 | 10.42 | 8.56 | 4.84 |
| 72 | 16.47 | 12.12 | 10.28 | 8.44 | 4.77 |
| 73 | 16.25 | 11.95 | 10.14 | 8.33 | 4.70 |
| 74 | 16.02 | 11.79 | 10.00 | 8.21 | 4.64 |
| 75 | 15.81 | 11.63 | 9.87 | 8.10 | 4.58 |
| 76 | 15.60 | 11.48 | 9.74 | 8.00 | 4.52 |
| 77 | 15.40 | 11.33 | 9.61 | 7.89 | 4.46 |
| 78 | 15.20 | 11.19 | 9.49 | 7.78 | 4.40 |
| 79 | 15.01 | 11.04 | 9.37 | 7.69 | 4.35 |
| 80 | 14.82 | 10.90 | 9.25 | 7.60 | 4.29 |
| 81 | 14.64 | 10.77 | 9.14 | 7.50 | 4.24 |
| 82 | 14.46 | 10.64 | 9.02 | 7.41 | 4.19 |
| 83 | 14.29 | 10.51 | 8.92 | 7.32 | 4.14 |
| 84 | 14.12 | 10.38 | 8.81 | 7.24 | 4.09 |
| 85 | 13.95 | 10.26 | 8.71 | 7.15 | 4.04 |
| 86 | 13.79 | 10.14 | 8.60 | 7.07 | 3.99 |
| 87 | 13.63 | 10.03 | 8.51 | 6.99 | 3.95 |
| 88 | 13.47 | 9.92 | 8.41 | 6.91 | 3.90 |
| 89 | 13.32 | 9.80 | 8.32 | 6.83 | 3.83 |
| 90 | 13.18 | 9.70 | 8.22 | 6.75 | 3.81 |
| 91 | 13.04 | 9.59 | 8.13 | 6.68 | 3.77 |
| 92 | 12.89 | 9.48 | 8.04 | 6.61 | 3.73 |
| 93 | 12.75 | 9.38 | 7.96 | 6.54 | 3.69 |
| 94 | 12.62 | 9.28 | 7.87 | 6.47 | 3.65 |
| 96 | 12.35 | 9.09 | 7.71 | 6.33 | 3.58 |
| 98 | 12.10 | 8.90 | 7.55 | 6.20 | 3.50 |
| 100 | 11.86 | 8.73 | 7.40 | 6.08 | 3.43 |
| 102 | 11.62 | 8.56 | 7.25 | 5.96 | 3.37 |
| 104 | 11.40 | 8.39 | 7.11 | 5.84 | 3.30 |
| 106 | 11.19 | 8.23 | 6.98 | 5.73 | 3.24 |
| 108 | 10.98 | 8.08 | 6.85 | 5.63 | 3.18 |
| 110 | 10.78 | 7.93 | 6.73 | 5.52 | 3.12 |
| Cons'ts | 1186.02 | 872.65 | 740.43 | 608.21 | 343.77 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 8 inches Diameter Ratio Cylinder to Whirl 1 to 7.80
 Whirl 1 inch Diameter Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15 | 75.16 | 55.30 | 46.92 | 38.54 | 21.78 |
| 16 | 70.46 | 51.84 | 43.99 | 36.14 | 20.42 |
| 17 | 66.32 | 48.79 | 41.40 | 34.01 | 19.22 |
| 18 | 62.69 | 46.08 | 39.10 | 32.12 | 18.15 |
| 19 | 59.34 | 43.66 | 37.04 | 30.43 | 17.19 |
| 20 | 56.37 | 41.47 | 35.19 | 28.90 | 16.33 |
| 21 | 53.69 | 39.50 | 33.51 | 27.53 | 15.55 |
| 22 | 51.24 | 37.70 | 31.99 | 26.29 | 14.85 |
| 23 | 49.02 | 36.06 | 30.60 | 25.13 | 14.20 |
| 24 | 46.98 | 34.56 | 29.32 | 24.09 | 13.61 |
| 25 | 45.09 | 33.14 | 28.15 | 23.12 | 13.07 |
| 26 | 43.36 | 31.90 | 27.07 | 22.23 | 12.56 |
| 27 | 41.75 | 30.72 | 26.07 | 21.41 | 12.10 |
| 28 | 40.30 | 29.62 | 25.14 | 20.65 | 11.67 |
| 29 | 38.88 | 28.60 | 24.27 | 19.93 | 11.30 |
| 30 | 37.58 | 27.65 | 23.46 | 19.27 | 10.84 |
| 31 | 36.37 | 26.76 | 22.70 | 18.63 | 10.54 |
| 32 | 35.23 | 25.92 | 21.99 | 18.07 | 10.21 |
| 33 | 34.16 | 25.19 | 21.33 | 17.52 | 9.90 |
| 34 | 33.16 | 24.39 | 20.64 | 17.00 | 9.61 |
| 35 | 32.21 | 23.70 | 20.11 | 16.51 | 9.33 |
| 36 | 31.32 | 23.04 | 19.55 | 16.06 | 9.07 |
| 37 | 30.47 | 22.42 | 19.02 | 15.62 | 8.83 |
| 38 | 29.67 | 21.83 | 18.52 | 15.21 | 8.54 |
| 39 | 28.85 | 21.27 | 18.05 | 14.82 | 8.38 |
| 40 | 28.18 | 20.73 | 17.59 | 14.45 | 8.16 |
| 41 | 27.49 | 20.23 | 17.16 | 14.10 | 7.97 |
| 42 | 26.84 | 19.75 | 16.75 | 13.76 | 7.77 |
| 43 | 26.26 | 19.29 | 16.37 | 13.44 | 7.59 |
| 44 | 25.62 | 18.75 | 15.99 | 13.14 | 7.42 |
| 45 | 25.05 | 18.43 | 15.64 | 12.84 | 7.26 |
| 46 | 24.51 | 18.03 | 15.30 | 12.56 | 7.10 |
| 47 | 23.98 | 17.65 | 14.97 | 12.30 | 6.95 |
| 48 | 23.49 | 17.28 | 14.66 | 12.04 | 6.80 |
| 49 | 23.01 | 16.93 | 14.34 | 11.79 | 6.66 |
| 50 | 22.54 | 16.57 | 14.07 | 11.56 | 6.53 |
| 51 | 22.10 | 16.26 | 13.80 | 11.33 | 6.40 |
| 52 | 21.68 | 15.95 | 13.53 | 11.11 | 6.28 |
| 53 | 21.27 | 15.65 | 13.28 | 10.90 | 6.16 |
| 54 | 20.88 | 15.36 | 13.08 | 10.70 | 6.05 |
| 55 | 20.49 | 15.08 | 12.79 | 10.51 | 5.94 |
| 56 | 20.15 | 14.81 | 12.57 | 10.32 | 5.83 |
| 57 | 19.78 | 14.55 | 12.35 | 10.14 | 5.73 |
| 58 | 19.38 | 14.30 | 12.13 | 9.96 | 5.63 |
| Cons'ts | 1127.45 | 829.56 | 703.87 | 578.17 | 326.79 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll 1½ inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 7.80

Whirl 1 inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 19.10 | 14.06 | 11.93 | 9.79 | 5.54 |
| 60 | 18.79 | 13.82 | 11.73 | 9.63 | 5.44 |
| 61 | 18.48 | 13.59 | 11.57 | 9.48 | 5.36 |
| 62 | 18.18 | 13.38 | 11.35 | 9.31 | 5.27 |
| 63 | 17.89 | 13.17 | 11.17 | 9.18 | 5.18 |
| 64 | 17.61 | 12.96 | 10.99 | 9.03 | 5.10 |
| 65 | 17.34 | 12.76 | 10.82 | 8.89 | 5.02 |
| 66 | 17.08 | 12.59 | 10.66 | 8.76 | 4.95 |
| 67 | 16.82 | 12.38 | 10.50 | 8.62 | 4.88 |
| 68 | 16.58 | 12.18 | 10.32 | 8.50 | 4.80 |
| 69 | 16.32 | 12.02 | 10.20 | 8.38 | 4.73 |
| 70 | 16.10 | 11.85 | 10.05 | 8.25 | 4.66 |
| 71 | 15.88 | 11.68 | 9.91 | 8.14 | 4.60 |
| 72 | 15.66 | 11.52 | 9.77 | 8.04 | 4.53 |
| 73 | 15.44 | 11.36 | 9.64 | 7.92 | 4.47 |
| 74 | 15.23 | 11.21 | 9.54 | 7.81 | 4.41 |
| 75 | 15.01 | 11.06 | 9.38 | 7.70 | 4.35 |
| 76 | 14.83 | 10.91 | 9.26 | 7.60 | 4.29 |
| 77 | 14.64 | 10.77 | 9.14 | 7.50 | 4.24 |
| 78 | 14.42 | 10.63 | 9.02 | 7.41 | 4.19 |
| 79 | 14.27 | 10.50 | 8.91 | 7.31 | 4.13 |
| 80 | 14.09 | 10.36 | 8.79 | 7.22 | 4.08 |
| 81 | 13.91 | 10.24 | 8.69 | 7.14 | 4.03 |
| 82 | 13.74 | 10.11 | 8.58 | 7.05 | 3.98 |
| 83 | 13.58 | 9.94 | 8.45 | 6.96 | 3.92 |
| 84 | 13.42 | 9.87 | 8.37 | 6.88 | 3.88 |
| 85 | 13.26 | 9.76 | 8.28 | 6.80 | 3.84 |
| 86 | 13.13 | 9.64 | 8.18 | 6.72 | 3.79 |
| 87 | 12.96 | 9.53 | 8.09 | 6.64 | 3.75 |
| 88 | 12.81 | 9.42 | 7.99 | 6.57 | 3.71 |
| 89 | 12.66 | 9.32 | 7.90 | 6.49 | 3.67 |
| 90 | 12.52 | 9.21 | 7.82 | 6.42 | 3.63 |
| 91 | 12.40 | 9.11 | 7.73 | 6.35 | 3.59 |
| 92 | 12.25 | 9.01 | 7.65 | 6.28 | 3.55 |
| 93 | 12.12 | 8.92 | 7.56 | 6.22 | 3.51 |
| 94 | 11.99 | 8.82 | 7.48 | 6.15 | 3.47 |
| 96 | 11.74 | 8.64 | 7.33 | 6.02 | 3.40 |
| 98 | 11.50 | 8.46 | 7.17 | 5.90 | 3.33 |
| 100 | 11.27 | 8.29 | 7.03 | 5.78 | 3.26 |
| 102 | 11.05 | 8.13 | 6.90 | 5.66 | 3.20 |
| 104 | 10.84 | 7.97 | 6.76 | 5.55 | 3.14 |
| 106 | 10.63 | 7.82 | 6.64 | 5.45 | 3.08 |
| 108 | 10.44 | 7.68 | 6.51 | 5.35 | 3.02 |
| 110 | 10.24 | 7.54 | 6.39 | 5.25 | 2.97 |
| Cons'ts | 1127.45 | 829.56 | 703.87 | 578.17 | 326.79 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 8 inches Diameter Ratio Cylinder to Whirl 1 to 7.30
 Whirl $1\frac{1}{16}$ inch Diameter Front Roll Gear 100 Teeth

| Change | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|---------|---------------------|---------------------|---------------------|--------------------|--------------------|
| Gears | Twist | Twist | Twist | Twist | Twist |
| 15 | 71.26 | 52.43 | 44.49 | 36.54 | 20.72 |
| 16 | 66.81 | 49.15 | 41.71 | 34.26 | 19.43 |
| 17 | 62.88 | 46.26 | 39.25 | 32.24 | 18.28 |
| 18 | 59.38 | 43.69 | 37.07 | 30.45 | 17.16 |
| 19 | 56.26 | 41.39 | 35.12 | 28.85 | 16.36 |
| 20 | 53.44 | 39.32 | 33.37 | 27.41 | 15.54 |
| 21 | 50.90 | 37.45 | 31.78 | 26.10 | 14.80 |
| 22 | 48.59 | 35.75 | 30.33 | 24.92 | 14.13 |
| 23 | 46.47 | 34.19 | 29.01 | 23.83 | 13.51 |
| 24 | 44.54 | 32.77 | 27.80 | 22.84 | 12.95 |
| 25 | 42.76 | 31.46 | 26.70 | 21.92 | 12.43 |
| 26 | 41.11 | 30.25 | 25.67 | 21.08 | 11.95 |
| 27 | 39.59 | 29.13 | 24.71 | 20.30 | 11.51 |
| 28 | 38.17 | 28.09 | 23.83 | 19.58 | 11.10 |
| 29 | 36.86 | 27.12 | 23.01 | 18.90 | 10.72 |
| 30 | 35.63 | 26.22 | 22.25 | 18.27 | 10.36 |
| 31 | 34.48 | 25.37 | 21.53 | 17.68 | 10.03 |
| 32 | 33.41 | 24.58 | 20.86 | 17.13 | 9.72 |
| 33 | 32.39 | 23.83 | 20.22 | 16.61 | 9.42 |
| 34 | 31.44 | 23.13 | 19.63 | 16.12 | 9.14 |
| 35 | 30.54 | 22.47 | 19.07 | 15.66 | 8.88 |
| 36 | 29.69 | 21.85 | 18.54 | 15.23 | 8.58 |
| 37 | 28.89 | 21.25 | 18.04 | 14.81 | 8.40 |
| 38 | 28.13 | 20.70 | 17.56 | 14.43 | 8.18 |
| 39 | 27.41 | 20.17 | 17.11 | 14.05 | 7.97 |
| 40 | 26.72 | 19.66 | 16.69 | 13.71 | 7.77 |
| 41 | 26.07 | 19.18 | 16.28 | 13.37 | 7.58 |
| 42 | 25.45 | 18.73 | 15.89 | 13.05 | 7.40 |
| 43 | 24.86 | 18.29 | 15.52 | 12.75 | 7.20 |
| 44 | 24.30 | 17.88 | 15.17 | 12.46 | 7.07 |
| 45 | 23.75 | 17.48 | 14.83 | 12.18 | 6.91 |
| 46 | 23.24 | 17.10 | 14.51 | 11.92 | 6.76 |
| 47 | 22.74 | 16.73 | 14.20 | 11.66 | 6.61 |
| 48 | 22.27 | 16.38 | 13.90 | 11.42 | 6.48 |
| 49 | 21.81 | 16.05 | 13.62 | 11.19 | 6.34 |
| 50 | 21.38 | 15.73 | 13.35 | 10.96 | 6.22 |
| 51 | 20.96 | 15.42 | 13.08 | 10.75 | 6.09 |
| 52 | 20.56 | 15.13 | 12.84 | 10.54 | 5.98 |
| 53 | 20.17 | 14.84 | 12.59 | 10.34 | 5.86 |
| 54 | 19.80 | 14.57 | 12.36 | 10.15 | 5.76 |
| 55 | 19.44 | 14.30 | 12.13 | 9.97 | 5.65 |
| 56 | 19.09 | 14.05 | 11.92 | 9.79 | 5.55 |
| 57 | 18.75 | 13.80 | 11.71 | 9.62 | 5.45 |
| 58 | 18.43 | 13.56 | 11.51 | 9.45 | 5.36 |
| Cons'ts | 1068.88 | 786.45 | 667.30 | 548.14 | 310.81 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 8 inches Diameter Ratio Cylinder to Whirl 1 to 7.30

Whirl $1\frac{1}{8}$ inch Diameter Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 18.12 | 13.33 | 11.31 | 9.29 | 5.27 |
| 60 | 17.82 | 13.11 | 11.13 | 9.14 | 5.18 |
| 61 | 17.52 | 12.89 | 10.94 | 8.99 | 5.10 |
| 62 | 17.24 | 12.69 | 10.77 | 8.84 | 5.02 |
| 63 | 16.97 | 12.48 | 10.59 | 8.70 | 4.93 |
| 64 | 16.71 | 12.29 | 10.43 | 8.57 | 4.86 |
| 65 | 16.44 | 12.10 | 10.27 | 8.43 | 4.78 |
| 66 | 16.20 | 11.92 | 10.11 | 8.31 | 4.71 |
| 67 | 15.95 | 11.74 | 9.96 | 8.18 | 4.64 |
| 68 | 15.72 | 11.57 | 9.82 | 8.06 | 4.57 |
| 69 | 15.49 | 11.40 | 9.67 | 7.94 | 4.50 |
| 70 | 15.27 | 11.24 | 9.54 | 7.83 | 4.44 |
| 71 | 15.05 | 11.08 | 9.40 | 7.72 | 4.38 |
| 72 | 14.85 | 10.93 | 9.27 | 7.62 | 4.29 |
| 73 | 14.64 | 10.77 | 9.14 | 7.51 | 4.26 |
| 74 | 14.45 | 10.63 | 9.02 | 7.41 | 4.20 |
| 75 | 14.25 | 10.49 | 8.90 | 7.31 | 4.14 |
| 76 | 14.07 | 10.35 | 8.78 | 7.22 | 4.09 |
| 77 | 13.89 | 10.21 | 8.67 | 7.12 | 4.04 |
| 78 | 13.71 | 10.09 | 8.56 | 7.03 | 3.99 |
| 79 | 13.53 | 9.96 | 8.45 | 6.94 | 3.93 |
| 80 | 13.36 | 9.83 | 8.35 | 6.85 | 3.89 |
| 81 | 13.20 | 9.71 | 8.24 | 6.77 | 3.83 |
| 82 | 13.04 | 9.59 | 8.14 | 6.69 | 3.79 |
| 83 | 12.88 | 9.48 | 8.04 | 6.60 | 3.74 |
| 84 | 12.73 | 9.37 | 7.95 | 6.53 | 3.70 |
| 85 | 12.58 | 9.25 | 7.85 | 6.45 | 3.66 |
| 86 | 12.43 | 9.15 | 7.76 | 6.38 | 3.62 |
| 87 | 12.29 | 9.04 | 7.67 | 6.30 | 3.57 |
| 88 | 12.15 | 8.94 | 7.59 | 6.23 | 3.54 |
| 89 | 12.01 | 8.84 | 7.50 | 6.16 | 3.49 |
| 90 | 11.88 | 8.74 | 7.42 | 6.09 | 3.46 |
| 91 | 11.75 | 8.64 | 7.33 | 6.02 | 3.42 |
| 92 | 11.62 | 8.55 | 7.26 | 5.96 | 3.38 |
| 93 | 11.49 | 8.46 | 7.18 | 5.89 | 3.34 |
| 94 | 11.37 | 8.37 | 7.10 | 5.83 | 3.31 |
| 96 | 11.14 | 8.19 | 6.95 | 5.71 | 3.24 |
| 98 | 10.91 | 8.03 | 6.81 | 5.60 | 3.17 |
| 100 | 10.69 | 7.87 | 6.68 | 5.48 | 3.11 |
| 102 | 10.48 | 7.71 | 6.54 | 5.38 | 3.05 |
| 104 | 10.28 | 7.57 | 6.42 | 5.27 | 2.99 |
| 106 | 10.09 | 7.42 | 6.30 | 5.17 | 2.93 |
| 108 | 9.90 | 7.29 | 6.18 | 5.08 | 2.88 |
| 110 | 9.72 | 7.15 | 6.07 | 4.99 | 2.83 |
| Cons'ts | 1068.88 | 786.45 | 667.30 | 548.14 | 310.81 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 8 inches Diameter Ratio Cylinder to Whirl 1 to 7.00
 Whirl $1\frac{1}{8}$ inch Diameter Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15 | 68.33 | 50.28 | 42.65 | 35.04 | 19.80 |
| 16 | 64.05 | 47.13 | 39.99 | 32.85 | 18.56 |
| 17 | 60.29 | 44.36 | 37.64 | 30.92 | 17.47 |
| 18 | 56.94 | 41.89 | 35.54 | 29.20 | 16.50 |
| 19 | 53.94 | 39.69 | 33.67 | 27.66 | 15.63 |
| 20 | 51.24 | 37.71 | 31.99 | 26.28 | 14.85 |
| 21 | 48.80 | 35.91 | 30.47 | 25.02 | 14.14 |
| 22 | 46.58 | 34.27 | 29.08 | 23.89 | 13.50 |
| 23 | 44.56 | 32.78 | 27.82 | 22.85 | 12.91 |
| 24 | 42.70 | 31.48 | 26.66 | 21.90 | 12.37 |
| 25 | 40.95 | 30.16 | 25.59 | 21.02 | 11.88 |
| 26 | 39.42 | 29.00 | 24.61 | 20.21 | 11.42 |
| 27 | 37.96 | 27.93 | 23.69 | 19.46 | 11.00 |
| 28 | 36.60 | 26.93 | 22.85 | 18.77 | 10.61 |
| 29 | 35.34 | 26.00 | 22.06 | 18.12 | 10.24 |
| 30 | 34.16 | 25.13 | 21.32 | 17.52 | 9.90 |
| 31 | 33.06 | 24.32 | 20.64 | 16.95 | 9.58 |
| 32 | 32.03 | 23.56 | 19.99 | 16.42 | 9.28 |
| 33 | 31.06 | 22.84 | 19.38 | 15.92 | 9.00 |
| 34 | 30.14 | 22.18 | 18.81 | 15.45 | 8.73 |
| 35 | 29.28 | 21.54 | 18.28 | 15.01 | 8.48 |
| 36 | 28.47 | 20.94 | 17.77 | 14.60 | 8.25 |
| 37 | 27.70 | 20.38 | 17.29 | 14.20 | 8.03 |
| 38 | 26.97 | 19.84 | 16.83 | 13.83 | 7.81 |
| 39 | 26.28 | 19.33 | 16.40 | 13.47 | 7.61 |
| 40 | 25.62 | 18.85 | 15.99 | 13.14 | 7.42 |
| 41 | 24.99 | 18.39 | 15.60 | 12.82 | 7.24 |
| 42 | 24.40 | 17.95 | 15.23 | 12.51 | 7.07 |
| 43 | 23.83 | 17.53 | 14.88 | 12.22 | 6.90 |
| 44 | 23.29 | 17.13 | 14.54 | 11.94 | 6.75 |
| 45 | 22.77 | 16.75 | 14.21 | 11.68 | 6.60 |
| 46 | 22.28 | 16.39 | 13.91 | 11.42 | 6.45 |
| 47 | 21.80 | 16.04 | 13.61 | 11.18 | 6.32 |
| 48 | 21.33 | 15.71 | 13.33 | 10.94 | 6.19 |
| 49 | 20.91 | 15.39 | 13.06 | 10.72 | 6.06 |
| 50 | 20.49 | 15.08 | 12.79 | 10.51 | 5.94 |
| 51 | 20.09 | 14.78 | 12.54 | 10.30 | 5.82 |
| 52 | 19.71 | 14.50 | 12.30 | 10.10 | 5.71 |
| 53 | 19.33 | 14.22 | 12.07 | 9.91 | 5.60 |
| 54 | 18.98 | 13.96 | 11.84 | 9.73 | 5.50 |
| 55 | 18.63 | 13.71 | 11.63 | 9.55 | 5.40 |
| 56 | 18.30 | 13.46 | 11.42 | 9.38 | 5.32 |
| 57 | 17.98 | 13.23 | 11.22 | 9.22 | 5.21 |
| 58 | 17.67 | 13.00 | 11.03 | 9.06 | 5.12 |
| Cons'ts | 1024.95 | 754.14 | 639.88 | 525.61 | 297.08 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll 1½ inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 7.00

Whirl 1⅛ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 17.37 | 12.78 | 10.84 | 8.90 | 5.03 |
| 60 | 17.08 | 12.57 | 10.66 | 8.76 | 4.95 |
| 61 | 16.80 | 12.36 | 10.48 | 8.61 | 4.87 |
| 62 | 16.53 | 12.16 | 10.32 | 8.47 | 4.79 |
| 63 | 16.26 | 11.97 | 10.15 | 8.34 | 4.71 |
| 64 | 16.01 | 11.78 | 9.99 | 8.21 | 4.64 |
| 65 | 15.76 | 11.60 | 9.84 | 8.09 | 4.57 |
| 66 | 15.52 | 11.42 | 9.69 | 7.96 | 4.50 |
| 67 | 15.29 | 11.25 | 9.55 | 7.84 | 4.43 |
| 68 | 15.02 | 11.09 | 9.41 | 7.72 | 4.37 |
| 69 | 14.85 | 10.93 | 9.27 | 7.61 | 4.30 |
| 70 | 14.64 | 10.77 | 9.14 | 7.50 | 4.24 |
| 71 | 14.43 | 10.62 | 9.01 | 7.40 | 4.18 |
| 72 | 14.23 | 10.47 | 8.88 | 7.30 | 4.12 |
| 73 | 14.04 | 10.33 | 8.76 | 7.20 | 4.06 |
| 74 | 13.85 | 10.19 | 8.64 | 7.10 | 4.01 |
| 75 | 13.66 | 10.05 | 8.53 | 7.00 | 3.96 |
| 76 | 13.48 | 9.92 | 8.41 | 6.91 | 3.90 |
| 77 | 13.31 | 9.79 | 8.31 | 6.82 | 3.85 |
| 78 | 13.14 | 9.66 | 8.20 | 6.73 | 3.80 |
| 79 | 12.97 | 9.54 | 8.09 | 6.65 | 3.77 |
| 80 | 12.81 | 9.42 | 7.99 | 6.57 | 3.71 |
| 81 | 12.65 | 9.31 | 7.89 | 6.48 | 3.66 |
| 82 | 12.49 | 9.19 | 7.80 | 6.40 | 3.62 |
| 83 | 12.34 | 9.08 | 7.70 | 6.33 | 3.57 |
| 84 | 12.20 | 8.97 | 7.61 | 6.25 | 3.53 |
| 85 | 12.05 | 8.87 | 7.52 | 6.18 | 3.49 |
| 86 | 11.91 | 8.76 | 7.44 | 6.11 | 3.45 |
| 87 | 11.78 | 8.66 | 7.35 | 6.04 | 3.41 |
| 88 | 11.64 | 8.56 | 7.27 | 5.97 | 3.37 |
| 89 | 11.51 | 8.46 | 7.19 | 5.90 | 3.33 |
| 90 | 11.38 | 8.37 | 7.10 | 5.84 | 3.30 |
| 91 | 11.26 | 8.28 | 7.03 | 5.77 | 3.26 |
| 92 | 11.14 | 8.19 | 6.94 | 5.71 | 3.22 |
| 93 | 11.02 | 8.10 | 6.88 | 5.65 | 3.19 |
| 94 | 10.90 | 8.02 | 6.80 | 5.59 | 3.16 |
| 96 | 10.67 | 7.85 | 6.66 | 5.47 | 3.09 |
| 98 | 10.45 | 7.69 | 6.52 | 5.36 | 3.03 |
| 100 | 10.24 | 7.54 | 6.39 | 5.25 | 2.97 |
| 102 | 10.04 | 7.39 | 6.27 | 5.15 | 2.91 |
| 104 | 9.85 | 7.25 | 6.15 | 5.05 | 2.84 |
| 106 | 9.66 | 7.11 | 6.03 | 4.95 | 2.80 |
| 108 | 9.49 | 6.98 | 5.92 | 4.86 | 2.75 |
| 110 | 9.31 | 6.85 | 5.81 | 4.77 | 2.70 |
| Cons'ts | 1024.95 | 754.14 | 639.88 | 525.61 | 297.08 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 5.90

Whirl $1\frac{5}{16}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15 | 57.59 | 42.38 | 35.95 | 29.53 | 16.69 |
| 16 | 53.99 | 39.73 | 33.71 | 27.69 | 15.65 |
| 17 | 50.82 | 37.39 | 31.72 | 26.06 | 14.73 |
| 18 | 47.99 | 35.31 | 29.96 | 24.61 | 13.91 |
| 19 | 45.47 | 33.45 | 28.39 | 23.32 | 13.18 |
| 20 | 43.19 | 31.78 | 26.97 | 22.15 | 12.52 |
| 21 | 41.14 | 30.27 | 25.68 | 21.10 | 11.92 |
| 22 | 39.27 | 28.89 | 24.51 | 20.14 | 11.38 |
| 23 | 37.56 | 27.64 | 23.45 | 19.26 | 10.89 |
| 24 | 36.00 | 26.48 | 22.47 | 18.46 | 10.43 |
| 25 | 34.56 | 25.43 | 21.57 | 17.72 | 10.02 |
| 26 | 33.23 | 24.45 | 20.74 | 17.04 | 9.63 |
| 27 | 32.00 | 23.54 | 19.97 | 16.41 | 9.27 |
| 28 | 30.85 | 22.70 | 19.26 | 15.82 | 8.94 |
| 29 | 29.79 | 21.92 | 18.60 | 15.28 | 8.63 |
| 30 | 28.79 | 21.19 | 17.97 | 14.76 | 8.34 |
| 31 | 27.87 | 20.50 | 17.40 | 14.29 | 8.08 |
| 32 | 26.99 | 19.86 | 16.85 | 13.84 | 7.82 |
| 33 | 26.18 | 19.26 | 16.34 | 13.42 | 7.59 |
| 34 | 25.41 | 18.69 | 15.86 | 13.03 | 7.36 |
| 35 | 24.68 | 18.16 | 15.41 | 12.66 | 7.15 |
| 36 | 23.99 | 17.65 | 14.98 | 12.30 | 6.95 |
| 37 | 23.35 | 17.18 | 14.58 | 11.97 | 6.77 |
| 38 | 22.73 | 16.72 | 14.19 | 11.66 | 6.59 |
| 39 | 22.15 | 16.30 | 13.83 | 11.36 | 6.42 |
| 40 | 21.59 | 15.89 | 13.48 | 11.07 | 6.26 |
| 41 | 21.07 | 15.50 | 13.15 | 10.81 | 6.11 |
| 42 | 20.57 | 15.13 | 12.84 | 10.55 | 5.96 |
| 43 | 20.09 | 14.78 | 12.54 | 10.30 | 5.82 |
| 44 | 19.63 | 14.44 | 12.25 | 10.07 | 5.69 |
| 45 | 19.20 | 14.13 | 11.98 | 9.84 | 5.56 |
| 46 | 18.78 | 13.82 | 11.72 | 9.63 | 5.44 |
| 47 | 18.38 | 13.52 | 11.47 | 9.43 | 5.33 |
| 48 | 18.00 | 13.24 | 11.23 | 9.23 | 5.21 |
| 49 | 17.63 | 12.97 | 11.01 | 9.04 | 5.11 |
| 50 | 17.28 | 12.71 | 10.78 | 8.86 | 5.01 |
| 51 | 16.94 | 12.46 | 10.57 | 8.69 | 4.91 |
| 52 | 16.61 | 12.22 | 10.37 | 8.52 | 4.81 |
| 53 | 16.30 | 11.99 | 10.18 | 8.36 | 4.72 |
| 54 | 16.00 | 11.77 | 9.98 | 8.20 | 4.63 |
| 55 | 15.71 | 11.56 | 9.81 | 8.05 | 4.55 |
| 56 | 15.42 | 11.35 | 9.63 | 7.91 | 4.47 |
| 57 | 15.16 | 11.15 | 9.46 | 7.77 | 4.39 |
| 58 | 14.89 | 10.96 | 9.30 | 7.64 | 4.31 |
| Cons'ts | 863.89 | 635.64 | 539.33 | 443.02 | 250.40 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 5.90

Whirl $1\frac{5}{8}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 14.64 | 10.77 | 9.14 | 7.51 | 4.24 |
| 60 | 14.39 | 10.59 | 8.98 | 7.38 | 4.17 |
| 61 | 14.16 | 10.42 | 8.84 | 7.26 | 4.10 |
| 62 | 13.93 | 10.25 | 8.70 | 7.14 | 4.04 |
| 63 | 13.71 | 10.09 | 8.56 | 7.03 | 3.97 |
| 64 | 13.49 | 9.93 | 8.42 | 6.92 | 3.91 |
| 65 | 13.29 | 9.78 | 8.30 | 6.82 | 3.85 |
| 66 | 13.09 | 9.63 | 8.17 | 6.71 | 3.79 |
| 67 | 12.89 | 9.49 | 8.05 | 6.61 | 3.74 |
| 68 | 12.70 | 9.34 | 7.93 | 6.51 | 3.68 |
| 69 | 12.52 | 9.21 | 7.82 | 6.42 | 3.63 |
| 70 | 12.34 | 9.08 | 7.70 | 6.33 | 3.57 |
| 71 | 12.17 | 8.95 | 7.60 | 6.24 | 3.53 |
| 72 | 11.99 | 8.82 | 7.49 | 6.15 | 3.47 |
| 73 | 11.83 | 8.71 | 7.39 | 6.07 | 3.43 |
| 74 | 11.67 | 8.59 | 7.29 | 5.98 | 3.38 |
| 75 | 11.52 | 8.48 | 7.19 | 5.91 | 3.34 |
| 76 | 11.36 | 8.36 | 7.09 | 5.83 | 3.29 |
| 77 | 11.22 | 8.25 | 7.00 | 5.75 | 3.25 |
| 78 | 11.07 | 8.15 | 6.91 | 5.68 | 3.21 |
| 79 | 10.94 | 8.05 | 6.83 | 5.61 | 3.17 |
| 80 | 10.79 | 7.94 | 6.74 | 5.53 | 3.13 |
| 81 | 10.67 | 7.85 | 6.66 | 5.47 | 3.09 |
| 82 | 10.53 | 7.75 | 6.57 | 5.40 | 3.05 |
| 83 | 10.41 | 7.66 | 6.50 | 5.34 | 3.02 |
| 84 | 10.28 | 7.56 | 6.42 | 5.27 | 2.98 |
| 85 | 10.16 | 7.48 | 6.34 | 5.21 | 2.95 |
| 86 | 10.04 | 7.39 | 6.27 | 5.15 | 2.91 |
| 87 | 9.93 | 7.31 | 6.20 | 5.09 | 2.88 |
| 88 | 9.81 | 7.22 | 6.12 | 5.03 | 2.84 |
| 89 | 9.71 | 7.14 | 6.06 | 4.98 | 2.81 |
| 90 | 9.60 | 7.06 | 5.99 | 4.92 | 2.78 |
| 91 | 9.49 | 6.98 | 5.93 | 4.87 | 2.75 |
| 92 | 9.39 | 6.91 | 5.86 | 4.81 | 2.72 |
| 93 | 9.29 | 6.83 | 5.80 | 4.76 | 2.69 |
| 94 | 9.19 | 6.76 | 5.73 | 4.71 | 2.66 |
| 96 | 9.00 | 6.62 | 5.61 | 4.61 | 2.60 |
| 98 | 8.81 | 6.48 | 5.50 | 4.52 | 2.55 |
| 100 | 8.64 | 6.35 | 5.39 | 4.43 | 2.50 |
| 102 | 8.47 | 6.23 | 5.28 | 4.34 | 2.45 |
| 104 | 8.30 | 6.11 | 5.18 | 4.26 | 2.40 |
| 106 | 8.15 | 5.99 | 5.09 | 4.18 | 2.36 |
| 108 | 8.00 | 5.88 | 4.99 | 4.10 | 2.31 |
| 110 | 7.85 | 5.78 | 4.90 | 4.02 | 2.27 |
| Cons'ts | 863.89 | 635.64 | 539.33 | 443.02 | 250.40 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 4.84

Whirl $1\frac{5}{8}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15 | 47.24 | 34.76 | 29.49 | 24.22 | 13.69 |
| 16 | 44.29 | 32.59 | 27.65 | 22.71 | 12.83 |
| 17 | 41.68 | 30.67 | 26.02 | 21.37 | 12.08 |
| 18 | 39.37 | 28.96 | 24.58 | 20.13 | 11.41 |
| 19 | 37.29 | 27.44 | 23.28 | 19.12 | 10.81 |
| 20 | 35.43 | 26.07 | 22.12 | 18.17 | 10.27 |
| 21 | 33.74 | 24.83 | 21.06 | 17.30 | 9.78 |
| 22 | 32.21 | 23.70 | 20.11 | 16.52 | 9.33 |
| 23 | 30.81 | 22.67 | 19.23 | 15.80 | 8.93 |
| 24 | 29.52 | 21.76 | 18.43 | 15.14 | 8.56 |
| 25 | 28.34 | 20.85 | 17.69 | 14.53 | 8.21 |
| 26 | 27.25 | 20.05 | 17.01 | 13.97 | 7.90 |
| 27 | 26.24 | 19.31 | 16.38 | 13.46 | 7.60 |
| 28 | 25.30 | 18.62 | 15.80 | 12.98 | 7.33 |
| 29 | 24.43 | 17.98 | 15.25 | 12.53 | 7.08 |
| 30 | 23.62 | 17.38 | 14.74 | 12.11 | 6.84 |
| 31 | 22.86 | 16.82 | 14.27 | 11.74 | 6.62 |
| 32 | 22.14 | 16.29 | 13.82 | 11.35 | 6.41 |
| 33 | 21.47 | 15.80 | 13.40 | 11.01 | 6.22 |
| 34 | 20.84 | 15.33 | 13.01 | 10.68 | 6.04 |
| 35 | 20.24 | 14.89 | 12.64 | 10.38 | 5.86 |
| 36 | 19.68 | 14.48 | 12.29 | 10.06 | 5.70 |
| 37 | 19.15 | 14.09 | 11.96 | 9.82 | 5.55 |
| 38 | 18.64 | 13.72 | 11.64 | 9.56 | 5.40 |
| 39 | 18.17 | 13.37 | 11.34 | 9.31 | 5.26 |
| 40 | 17.71 | 13.03 | 11.06 | 9.08 | 5.13 |
| 41 | 17.28 | 12.72 | 10.79 | 8.86 | 5.01 |
| 42 | 16.87 | 12.41 | 10.53 | 8.65 | 4.89 |
| 43 | 16.48 | 12.12 | 10.28 | 8.45 | 4.77 |
| 44 | 16.10 | 11.85 | 10.05 | 8.26 | 4.66 |
| 45 | 15.74 | 11.58 | 9.83 | 8.07 | 4.56 |
| 46 | 15.40 | 11.33 | 9.61 | 7.90 | 4.46 |
| 47 | 15.07 | 11.09 | 9.41 | 7.73 | 4.37 |
| 48 | 14.76 | 10.88 | 9.21 | 7.57 | 4.28 |
| 49 | 14.25 | 10.64 | 9.02 | 7.41 | 4.19 |
| 50 | 14.17 | 10.42 | 8.84 | 7.26 | 4.10 |
| 51 | 13.89 | 10.22 | 8.67 | 7.12 | 4.02 |
| 52 | 13.62 | 10.02 | 8.50 | 6.98 | 3.95 |
| 53 | 13.37 | 9.85 | 8.34 | 6.85 | 3.87 |
| 54 | 13.12 | 9.65 | 8.19 | 6.73 | 3.80 |
| 55 | 12.88 | 9.48 | 8.04 | 6.60 | 3.73 |
| 56 | 12.65 | 9.31 | 7.90 | 6.49 | 3.66 |
| 57 | 12.43 | 9.14 | 7.76 | 6.37 | 3.60 |
| 58 | 12.21 | 8.64 | 7.62 | 6.26 | 3.54 |
| Cons'ts | 708.67 | 521.44 | 442.43 | 363.43 | 205.42 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 4.84

Whirl $1\frac{5}{8}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 12.01 | 8.83 | 7.49 | 6.16 | 3.48 |
| 60 | 17.81 | 8.69 | 7.37 | 6.05 | 3.42 |
| 61 | 11.61 | 8.55 | 7.25 | 5.95 | 3.36 |
| 62 | 11.43 | 8.41 | 7.13 | 5.87 | 3.31 |
| 63 | 11.24 | 8.27 | 7.02 | 5.76 | 3.26 |
| 64 | 11.07 | 8.14 | 6.91 | 5.67 | 3.20 |
| 65 | 10.90 | 8.02 | 6.80 | 5.59 | 3.16 |
| 66 | 10.73 | 7.90 | 6.70 | 5.50 | 3.11 |
| 67 | 10.57 | 7.78 | 6.60 | 5.42 | 3.06 |
| 68 | 10.42 | 7.66 | 6.50 | 5.34 | 3.02 |
| 69 | 10.27 | 7.55 | 6.41 | 5.26 | 2.97 |
| 70 | 10.12 | 7.44 | 6.32 | 5.19 | 2.93 |
| 71 | 9.98 | 7.34 | 6.23 | 5.11 | 2.89 |
| 72 | 9.84 | 7.24 | 6.14 | 5.03 | 2.85 |
| 73 | 9.70 | 7.14 | 6.06 | 4.97 | 2.81 |
| 74 | 9.57 | 7.04 | 5.98 | 4.91 | 2.77 |
| 75 | 9.44 | 6.95 | 5.89 | 4.84 | 2.73 |
| 76 | 9.32 | 6.86 | 5.82 | 4.78 | 2.70 |
| 77 | 9.20 | 6.77 | 5.74 | 4.72 | 2.66 |
| 78 | 9.08 | 6.68 | 5.62 | 4.65 | 2.63 |
| 79 | 8.97 | 6.60 | 5.60 | 4.60 | 2.60 |
| 80 | 8.85 | 6.51 | 5.53 | 4.54 | 2.56 |
| 81 | 8.74 | 6.43 | 5.46 | 4.48 | 2.53 |
| 82 | 8.64 | 6.36 | 5.39 | 4.43 | 2.50 |
| 83 | 8.53 | 6.28 | 5.33 | 4.37 | 2.47 |
| 84 | 8.43 | 6.20 | 5.26 | 4.32 | 2.44 |
| 85 | 8.33 | 6.13 | 5.20 | 4.27 | 2.41 |
| 86 | 8.24 | 6.06 | 5.14 | 4.22 | 2.38 |
| 87 | 8.14 | 5.99 | 5.08 | 4.17 | 2.36 |
| 88 | 8.05 | 5.92 | 5.02 | 4.13 | 2.33 |
| 89 | 7.96 | 5.85 | 4.97 | 4.08 | 2.30 |
| 90 | 7.87 | 5.79 | 4.91 | 4.03 | 2.28 |
| 91 | 7.78 | 5.73 | 4.86 | 3.99 | 2.25 |
| 92 | 7.70 | 5.66 | 4.80 | 3.95 | 2.23 |
| 93 | 7.62 | 5.60 | 4.75 | 3.90 | 2.20 |
| 94 | 7.53 | 5.54 | 4.70 | 3.86 | 2.18 |
| 96 | 7.38 | 5.43 | 4.60 | 3.78 | 2.14 |
| 98 | 7.22 | 5.32 | 4.51 | 3.70 | 2.09 |
| 100 | 7.08 | 5.21 | 4.42 | 3.63 | 2.05 |
| 102 | 6.94 | 5.11 | 4.33 | 3.56 | 2.01 |
| 104 | 6.81 | 5.01 | 4.25 | 3.49 | 1.97 |
| 106 | 6.68 | 4.91 | 4.17 | 3.42 | 1.93 |
| 108 | 6.56 | 4.82 | 4.09 | 3.36 | 1.90 |
| 110 | 6.44 | 4.74 | 4.02 | 3.30 | 1.86 |
| Const's | 708.67 | 521.44 | 442.43 | 363.43 | 205.42 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 4.52

Whirl $1\frac{3}{4}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15 | 44.12 | 32.44 | 27.46 | 22.63 | 12.79 |
| 16 | 41.37 | 30.43 | 25.82 | 21.21 | 11.99 |
| 17 | 38.94 | 28.64 | 24.30 | 19.95 | 11.28 |
| 18 | 36.77 | 27.05 | 22.95 | 18.81 | 10.66 |
| 19 | 34.84 | 25.62 | 21.80 | 17.86 | 10.10 |
| 20 | 33.09 | 24.34 | 20.66 | 16.97 | 9.59 |
| 21 | 31.52 | 23.19 | 19.67 | 16.16 | 9.13 |
| 22 | 30.08 | 22.14 | 18.78 | 15.43 | 8.72 |
| 23 | 28.78 | 21.17 | 17.96 | 14.76 | 8.34 |
| 24 | 27.58 | 20.29 | 17.22 | 14.14 | 7.99 |
| 25 | 26.48 | 19.48 | 16.53 | 13.58 | 7.67 |
| 26 | 25.46 | 18.73 | 15.89 | 13.05 | 7.38 |
| 27 | 24.52 | 18.03 | 15.30 | 12.57 | 7.10 |
| 28 | 23.64 | 17.39 | 14.76 | 12.12 | 6.85 |
| 29 | 22.82 | 16.79 | 14.25 | 11.70 | 6.61 |
| 30 | 22.06 | 16.23 | 13.77 | 11.31 | 6.39 |
| 31 | 21.35 | 15.71 | 13.33 | 10.95 | 6.19 |
| 32 | 20.68 | 15.21 | 12.91 | 10.60 | 5.99 |
| 33 | 20.06 | 14.75 | 12.52 | 10.28 | 5.81 |
| 34 | 19.47 | 14.32 | 12.15 | 9.97 | 5.64 |
| 35 | 18.91 | 13.91 | 11.81 | 9.70 | 5.48 |
| 36 | 18.39 | 13.52 | 11.47 | 9.40 | 5.33 |
| 37 | 17.89 | 13.16 | 11.17 | 9.17 | 5.18 |
| 38 | 17.42 | 12.81 | 10.87 | 8.93 | 5.05 |
| 39 | 16.97 | 12.48 | 10.59 | 8.70 | 4.92 |
| 40 | 16.54 | 12.17 | 10.33 | 8.48 | 4.79 |
| 41 | 16.14 | 11.88 | 10.08 | 8.28 | 4.68 |
| 42 | 15.76 | 11.59 | 9.83 | 8.08 | 4.51 |
| 43 | 15.39 | 11.32 | 9.61 | 7.89 | 4.46 |
| 44 | 15.04 | 11.07 | 9.39 | 7.71 | 4.36 |
| 45 | 14.71 | 10.82 | 9.18 | 7.54 | 4.26 |
| 46 | 14.39 | 10.58 | 8.98 | 7.38 | 4.16 |
| 47 | 14.08 | 10.36 | 8.79 | 7.22 | 4.08 |
| 48 | 13.74 | 10.14 | 8.61 | 7.07 | 3.99 |
| 49 | 13.51 | 9.94 | 8.43 | 6.93 | 3.91 |
| 50 | 13.24 | 9.74 | 8.26 | 6.79 | 3.83 |
| 51 | 12.98 | 9.55 | 8.10 | 6.65 | 3.76 |
| 52 | 12.73 | 9.36 | 7.99 | 6.52 | 3.69 |
| 53 | 12.49 | 9.19 | 7.80 | 6.40 | 3.62 |
| 54 | 12.26 | 9.01 | 7.65 | 6.28 | 3.55 |
| 55 | 12.03 | 8.85 | 7.51 | 6.17 | 3.49 |
| 56 | 11.82 | 8.69 | 7.38 | 6.06 | 3.47 |
| 57 | 11.61 | 8.53 | 7.25 | 5.95 | 3.36 |
| 58 | 11.41 | 8.39 | 7.12 | 5.85 | 3.30 |
| Const's | 661.82 | 486.88 | 413.18 | 339.39 | 191.83 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 4.52

Whirl $1\frac{3}{4}$ inch Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 11.22 | 8.25 | 7.00 | 5.75 | 3.25 |
| 60 | 11.03 | 8.11 | 6.86 | 5.65 | 3.19 |
| 61 | 10.85 | 7.98 | 6.77 | 5.56 | 3.14 |
| 62 | 10.67 | 7.85 | 6.66 | 5.47 | 3.09 |
| 63 | 10.51 | 7.73 | 6.54 | 5.39 | 3.04 |
| 64 | 10.34 | 7.60 | 6.45 | 5.30 | 2.99 |
| 65 | 10.18 | 7.49 | 6.36 | 5.23 | 2.95 |
| 66 | 10.03 | 7.37 | 6.26 | 5.14 | 2.90 |
| 67 | 9.88 | 7.27 | 6.17 | 5.06 | 2.86 |
| 68 | 9.73 | 7.16 | 6.07 | 4.98 | 2.82 |
| 69 | 9.57 | 7.06 | 5.99 | 4.92 | 2.78 |
| 70 | 9.45 | 6.95 | 5.90 | 4.85 | 2.74 |
| 71 | 9.32 | 6.86 | 5.82 | 4.78 | 2.70 |
| 72 | 9.19 | 6.76 | 5.73 | 4.70 | 2.66 |
| 73 | 9.07 | 6.70 | 5.66 | 4.65 | 2.63 |
| 74 | 8.94 | 6.58 | 5.58 | 4.58 | 2.59 |
| 75 | 8.83 | 6.49 | 5.51 | 4.52 | 2.56 |
| 76 | 8.71 | 6.40 | 5.45 | 4.46 | 2.52 |
| 77 | 8.60 | 6.32 | 5.37 | 4.41 | 2.49 |
| 78 | 8.48 | 6.24 | 5.29 | 4.35 | 2.46 |
| 79 | 8.38 | 6.16 | 5.23 | 4.30 | 2.43 |
| 80 | 8.27 | 6.08 | 5.16 | 4.24 | 2.39 |
| 81 | 8.17 | 6.01 | 5.10 | 4.19 | 2.37 |
| 82 | 8.07 | 5.94 | 5.04 | 4.14 | 2.34 |
| 83 | 7.97 | 5.88 | 4.98 | 4.09 | 2.31 |
| 84 | 7.88 | 5.79 | 4.91 | 4.04 | 2.28 |
| 85 | 7.79 | 5.73 | 4.86 | 3.99 | 2.26 |
| 86 | 7.69 | 5.66 | 4.80 | 3.94 | 2.23 |
| 87 | 7.61 | 5.60 | 4.75 | 3.90 | 2.20 |
| 88 | 7.52 | 5.53 | 4.69 | 3.85 | 2.18 |
| 89 | 7.44 | 5.47 | 4.64 | 3.81 | 2.15 |
| 90 | 7.35 | 5.41 | 4.59 | 3.77 | 2.13 |
| 91 | 7.27 | 5.35 | 4.54 | 3.73 | 2.11 |
| 92 | 7.19 | 5.29 | 4.49 | 3.69 | 2.08 |
| 93 | 7.12 | 5.23 | 4.44 | 3.65 | 2.06 |
| 94 | 7.04 | 5.18 | 4.39 | 3.61 | 2.04 |
| 96 | 6.87 | 5.07 | 4.30 | 3.53 | 1.99 |
| 98 | 6.75 | 4.97 | 4.21 | 3.46 | 1.95 |
| 100 | 6.62 | 4.87 | 4.13 | 3.39 | 1.91 |
| 102 | 6.49 | 4.77 | 4.05 | 3.32 | 1.88 |
| 104 | 6.36 | 4.68 | 3.99 | 3.26 | 1.84 |
| 106 | 6.24 | 4.59 | 3.90 | 3.20 | 1.81 |
| 108 | 6.13 | 4.50 | 3.82 | 3.14 | 1.77 |
| 110 | 6.01 | 4.42 | 3.75 | 3.08 | 1.74 |
| Const's | 661.82 | 486.88 | 413.18 | 339.39 | 191.83 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll 1½ inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 4.

Whirl 2 inches Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15 | 39.04 | 28.72 | 24.37 | 20.02 | 11.32 |
| 16 | 36.60 | 26.93 | 22.85 | 18.77 | 10.61 |
| 17 | 34.45 | 25.34 | 21.51 | 17.66 | 9.98 |
| 18 | 32.54 | 23.94 | 20.31 | 16.68 | 9.43 |
| 19 | 30.82 | 22.68 | 19.24 | 15.80 | 8.93 |
| 20 | 29.28 | 21.54 | 18.28 | 15.01 | 8.48 |
| 21 | 27.84 | 20.52 | 17.41 | 14.30 | 8.08 |
| 22 | 26.62 | 19.58 | 16.62 | 13.65 | 7.71 |
| 23 | 25.46 | 18.73 | 15.89 | 13.06 | 7.38 |
| 24 | 24.40 | 17.95 | 15.23 | 12.51 | 7.07 |
| 25 | 23.42 | 17.23 | 14.62 | 12.01 | 6.79 |
| 26 | 22.52 | 16.57 | 14.06 | 11.55 | 6.53 |
| 27 | 21.69 | 15.96 | 13.54 | 11.12 | 6.29 |
| 28 | 20.91 | 15.39 | 13.06 | 10.72 | 6.06 |
| 29 | 20.19 | 14.85 | 12.61 | 10.35 | 5.85 |
| 30 | 19.52 | 14.36 | 12.18 | 10.01 | 5.66 |
| 31 | 18.89 | 13.90 | 11.79 | 9.69 | 5.47 |
| 32 | 18.30 | 13.46 | 11.42 | 9.39 | 5.30 |
| 33 | 17.77 | 13.05 | 11.08 | 9.10 | 5.14 |
| 34 | 17.22 | 12.67 | 10.75 | 8.83 | 4.99 |
| 35 | 16.73 | 12.31 | 10.44 | 8.58 | 4.85 |
| 36 | 16.26 | 11.97 | 10.16 | 8.35 | 4.71 |
| 37 | 15.83 | 11.64 | 9.88 | 8.12 | 4.58 |
| 38 | 15.41 | 11.34 | 9.62 | 7.90 | 4.47 |
| 39 | 15.02 | 11.04 | 9.37 | 7.70 | 4.35 |
| 40 | 14.64 | 10.77 | 9.14 | 7.51 | 4.24 |
| 41 | 14.28 | 10.51 | 8.92 | 7.32 | 4.14 |
| 42 | 13.94 | 10.26 | 8.70 | 7.15 | 4.04 |
| 43 | 13.62 | 10.02 | 8.50 | 6.98 | 3.95 |
| 44 | 13.31 | 9.79 | 8.31 | 6.82 | 3.86 |
| 45 | 13.01 | 9.57 | 8.12 | 6.67 | 3.77 |
| 46 | 12.73 | 9.36 | 7.95 | 6.53 | 3.69 |
| 47 | 12.46 | 9.16 | 7.78 | 6.39 | 3.61 |
| 48 | 12.20 | 8.97 | 7.62 | 6.26 | 3.53 |
| 49 | 11.95 | 8.79 | 7.46 | 6.13 | 3.46 |
| 50 | 11.71 | 8.61 | 7.31 | 6.01 | 3.39 |
| 51 | 11.48 | 8.44 | 7.17 | 5.89 | 3.33 |
| 52 | 11.26 | 8.28 | 7.03 | 5.77 | 3.26 |
| 53 | 11.05 | 8.13 | 6.90 | 5.66 | 3.20 |
| 54 | 10.84 | 7.96 | 6.77 | 5.57 | 3.14 |
| 55 | 10.65 | 7.83 | 6.65 | 5.46 | 3.08 |
| 56 | 10.45 | 7.69 | 6.53 | 5.36 | 3.03 |
| 57 | 10.27 | 7.56 | 6.41 | 5.26 | 2.98 |
| 58 | 10.09 | 7.46 | 6.30 | 5.17 | 2.92 |
| Const's | 585.68 | 430.93 | 365.65 | 300.35 | 169.76 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll 1½ inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 4.00

Whirl 2 inches Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 9.91 | 7.30 | 6.19 | 5.03 | 2.88 |
| 60 | 9.76 | 7.18 | 6.09 | 5.00 | 2.83 |
| 61 | 9.60 | 7.06 | 5.99 | 4.92 | 2.78 |
| 62 | 9.44 | 6.95 | 5.88 | 4.84 | 2.74 |
| 63 | 9.28 | 6.84 | 5.80 | 4.77 | 2.69 |
| 64 | 9.15 | 6.73 | 5.71 | 4.69 | 2.65 |
| 65 | 9.01 | 6.62 | 5.62 | 4.60 | 2.61 |
| 66 | 8.87 | 6.52 | 5.54 | 4.55 | 2.57 |
| 67 | 8.74 | 6.43 | 5.45 | 4.48 | 2.53 |
| 68 | 8.61 | 6.33 | 5.37 | 4.41 | 2.49 |
| 69 | 8.48 | 6.24 | 5.29 | 4.35 | 2.46 |
| 70 | 8.36 | 6.15 | 5.22 | 4.29 | 2.42 |
| 71 | 8.25 | 6.06 | 5.15 | 4.23 | 2.39 |
| 72 | 8.13 | 5.98 | 5.08 | 4.17 | 2.35 |
| 73 | 8.02 | 5.90 | 5.01 | 4.11 | 2.32 |
| 74 | 7.91 | 5.82 | 4.94 | 4.06 | 2.30 |
| 75 | 7.81 | 5.72 | 4.87 | 4.00 | 2.26 |
| 76 | 7.70 | 5.67 | 4.81 | 3.95 | 2.23 |
| 77 | 7.60 | 5.59 | 4.75 | 3.90 | 2.20 |
| 78 | 7.51 | 5.52 | 4.68 | 3.85 | 2.17 |
| 79 | 7.41 | 5.45 | 4.62 | 3.80 | 2.14 |
| 80 | 7.32 | 5.38 | 4.57 | 3.75 | 2.12 |
| 81 | 7.23 | 5.32 | 4.51 | 3.70 | 2.09 |
| 82 | 7.14 | 5.25 | 4.46 | 3.66 | 2.07 |
| 83 | 7.05 | 5.19 | 4.40 | 3.62 | 2.04 |
| 84 | 6.96 | 5.13 | 4.35 | 3.57 | 2.02 |
| 85 | 6.89 | 5.06 | 4.30 | 3.53 | 1.99 |
| 86 | 6.81 | 5.01 | 4.25 | 3.49 | 1.97 |
| 87 | 6.73 | 4.95 | 4.20 | 3.45 | 1.95 |
| 88 | 6.65 | 4.89 | 4.15 | 3.41 | 1.93 |
| 89 | 6.58 | 4.84 | 4.11 | 3.37 | 1.90 |
| 90 | 6.50 | 4.78 | 4.06 | 3.33 | 1.88 |
| 91 | 6.43 | 4.73 | 4.02 | 3.30 | 1.86 |
| 92 | 6.36 | 4.69 | 3.97 | 3.26 | 1.84 |
| 93 | 6.29 | 4.63 | 3.93 | 3.22 | 1.82 |
| 94 | 6.23 | 4.58 | 3.89 | 3.19 | 1.80 |
| 96 | 6.10 | 4.48 | 3.81 | 3.13 | 1.76 |
| 98 | 5.97 | 4.39 | 3.73 | 3.06 | 1.73 |
| 100 | 5.85 | 4.30 | 3.65 | 3.00 | 1.69 |
| 102 | 5.74 | 4.22 | 3.58 | 2.94 | 1.66 |
| 104 | 5.63 | 4.14 | 3.51 | 2.89 | 1.63 |
| 106 | 5.52 | 4.06 | 3.45 | 2.83 | 1.60 |
| 108 | 5.42 | 3.99 | 3.38 | 2.78 | 1.57 |
| 110 | 5.32 | 3.91 | 3.32 | 2.73 | 1.54 |
| Const's | 585.68 | 430.93 | 365.65 | 300.35 | 169.76 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 3.20

Whirl $2\frac{1}{2}$ inches Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 15 | 31.23 | 22.98 | 19.50 | 16.01 | 9.05 |
| 16 | 29.28 | 21.54 | 18.28 | 15.01 | 8.48 |
| 17 | 27.56 | 20.27 | 17.20 | 14.13 | 7.98 |
| 18 | 26.03 | 19.15 | 16.25 | 13.34 | 7.54 |
| 19 | 24.65 | 18.14 | 15.39 | 12.64 | 7.14 |
| 20 | 23.42 | 17.23 | 14.62 | 12.01 | 6.79 |
| 21 | 22.31 | 16.41 | 13.92 | 11.44 | 6.46 |
| 22 | 21.29 | 15.67 | 13.29 | 10.92 | 6.17 |
| 23 | 20.36 | 14.98 | 12.71 | 10.44 | 5.90 |
| 24 | 19.52 | 14.36 | 12.18 | 10.01 | 5.65 |
| 25 | 18.74 | 13.78 | 11.70 | 9.61 | 5.43 |
| 26 | 18.02 | 13.25 | 11.25 | 9.24 | 5.22 |
| 27 | 17.35 | 12.76 | 10.83 | 8.89 | 5.03 |
| 28 | 16.73 | 12.31 | 10.44 | 8.58 | 4.85 |
| 29 | 16.15 | 11.88 | 10.08 | 8.29 | 4.68 |
| 30 | 15.61 | 11.49 | 9.75 | 8.00 | 4.52 |
| 31 | 15.11 | 11.12 | 9.43 | 7.78 | 4.34 |
| 32 | 14.64 | 10.70 | 9.14 | 7.50 | 4.24 |
| 33 | 14.19 | 10.44 | 8.86 | 7.28 | 4.11 |
| 34 | 13.78 | 10.13 | 8.60 | 7.06 | 3.99 |
| 35 | 13.38 | 9.84 | 8.35 | 6.86 | 3.88 |
| 36 | 13.01 | 9.57 | 8.12 | 6.67 | 3.77 |
| 37 | 12.66 | 9.37 | 7.90 | 6.49 | 3.67 |
| 38 | 12.32 | 9.07 | 7.69 | 6.32 | 3.57 |
| 39 | 12.01 | 8.83 | 7.50 | 6.16 | 3.48 |
| 40 | 11.71 | 8.61 | 7.31 | 6.00 | 3.39 |
| 41 | 11.42 | 8.40 | 7.13 | 5.86 | 3.31 |
| 42 | 11.15 | 8.20 | 6.96 | 5.72 | 3.23 |
| 43 | 10.89 | 8.01 | 6.80 | 5.58 | 3.15 |
| 44 | 10.64 | 7.83 | 6.64 | 5.46 | 3.08 |
| 45 | 10.40 | 7.66 | 6.50 | 5.33 | 3.01 |
| 46 | 10.18 | 7.49 | 6.35 | 5.22 | 2.95 |
| 47 | 9.96 | 7.33 | 6.20 | 5.11 | 2.88 |
| 48 | 9.76 | 7.18 | 6.09 | 5.00 | 2.82 |
| 49 | 9.56 | 7.03 | 5.96 | 4.90 | 2.79 |
| 50 | 9.37 | 6.89 | 5.85 | 4.80 | 2.71 |
| 51 | 9.18 | 6.75 | 5.73 | 4.71 | 2.66 |
| 52 | 9.01 | 6.62 | 5.62 | 4.62 | 2.61 |
| 53 | 8.84 | 6.50 | 5.51 | 4.53 | 2.56 |
| 54 | 8.67 | 6.38 | 5.41 | 4.44 | 2.51 |
| 55 | 8.51 | 6.26 | 5.31 | 4.36 | 2.46 |
| 56 | 8.36 | 6.16 | 5.22 | 4.29 | 2.42 |
| 57 | 8.21 | 6.04 | 5.13 | 4.21 | 2.38 |
| 58 | 8.07 | 5.94 | 5.04 | 4.11 | 2.34 |
| Const's | 468.55 | 344.74 | 292.51 | 240.28 | 135.81 |

TAPE DRIVE

TWISTER TWIST GEAR TABLE

Front Roll $1\frac{1}{2}$ inch Diameter

Cylinder 8 inches Diameter

Ratio Cylinder to Whirl 1 to 3.20

Whirl $2\frac{1}{2}$ inches Diameter

Front Roll Gear 100 Teeth

| Change Gears | Cyl. 20 Stud 138 | Cyl. 26 Stud 132 | Cyl. 26 Stud 112 | Cyl. 26 Stud 92 | Cyl. 46 Stud 92 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| | Twist | Twist | Twist | Twist | Twist |
| 59 | 7.94 | 5.84 | 4.95 | 4.07 | 2.30 |
| 60 | 7.80 | 5.74 | 4.87 | 4.00 | 2.26 |
| 61 | 7.68 | 5.65 | 4.79 | 3.93 | 2.22 |
| 62 | 7.55 | 5.56 | 4.72 | 3.89 | 2.17 |
| 63 | 7.43 | 5.47 | 4.64 | 3.81 | 2.15 |
| 64 | 7.32 | 5.38 | 4.57 | 3.75 | 2.12 |
| 65 | 7.20 | 5.30 | 4.50 | 3.68 | 2.08 |
| 66 | 7.09 | 5.22 | 4.43 | 3.64 | 2.05 |
| 67 | 6.99 | 5.14 | 4.37 | 3.58 | 2.02 |
| 68 | 6.89 | 5.06 | 4.30 | 3.53 | 1.99 |
| 69 | 6.78 | 4.99 | 4.23 | 3.48 | 1.96 |
| 70 | 6.69 | 4.92 | 4.17 | 3.42 | 1.94 |
| 71 | 6.59 | 4.85 | 4.11 | 3.37 | 1.91 |
| 72 | 6.50 | 4.78 | 4.06 | 3.33 | 1.88 |
| 73 | 6.41 | 4.72 | 4.00 | 3.29 | 1.86 |
| 74 | 6.33 | 4.65 | 3.95 | 3.24 | 1.83 |
| 75 | 6.24 | 4.59 | 3.90 | 3.20 | 1.81 |
| 76 | 6.16 | 4.53 | 3.84 | 3.18 | 1.78 |
| 77 | 6.08 | 4.47 | 3.79 | 3.12 | 1.76 |
| 78 | 6.00 | 4.41 | 3.75 | 3.08 | 1.74 |
| 79 | 5.93 | 4.36 | 3.70 | 3.04 | 1.71 |
| 80 | 5.85 | 4.30 | 3.65 | 3.00 | 1.69 |
| 81 | 5.78 | 4.25 | 3.61 | 2.96 | 1.67 |
| 82 | 5.71 | 4.20 | 3.56 | 2.93 | 1.65 |
| 83 | 5.64 | 4.15 | 3.52 | 2.89 | 1.63 |
| 84 | 5.57 | 4.10 | 3.48 | 2.86 | 1.61 |
| 85 | 5.51 | 4.05 | 3.44 | 2.82 | 1.59 |
| 86 | 5.44 | 4.00 | 3.40 | 2.79 | 1.57 |
| 87 | 5.38 | 3.96 | 3.36 | 2.74 | 1.56 |
| 88 | 5.32 | 3.91 | 3.32 | 2.73 | 1.54 |
| 89 | 5.26 | 3.86 | 3.28 | 2.69 | 1.51 |
| 90 | 5.20 | 3.83 | 3.25 | 2.66 | 1.50 |
| 91 | 5.14 | 3.78 | 3.21 | 2.64 | 1.49 |
| 92 | 5.09 | 3.74 | 3.17 | 2.61 | 1.47 |
| 93 | 5.03 | 3.70 | 3.14 | 2.59 | 1.46 |
| 94 | 4.98 | 3.66 | 3.10 | 2.55 | 1.44 |
| 96 | 4.88 | 3.59 | 3.04 | 2.50 | 1.41 |
| 98 | 4.78 | 3.51 | 2.98 | 2.45 | 1.38 |
| 100 | 4.68 | 3.44 | 2.92 | 2.40 | 1.35 |
| 102 | 4.59 | 3.37 | 2.86 | 2.35 | 1.33 |
| 104 | 4.50 | 3.31 | 2.81 | 2.31 | 1.30 |
| 106 | 4.42 | 3.25 | 2.75 | 2.26 | 1.28 |
| 108 | 4.33 | 3.19 | 2.70 | 2.22 | 1.25 |
| 110 | 4.25 | 3.13 | 2.65 | 2.18 | 1.23 |
| Const's | 468.55 | 344.74 | 292.51 | 240.28 | 135.81 |

Table Showing Number Pounds Twisted Yarn Produced in Ten Hours.—2 Ply.

| No of Yarn to be Twisted. | Rev of Spindle per Minute. | Multiplier 4. | | | Multiplier 5. | | | Multiplier 6. | | | Space of Frame in Inches | Dia. of Ring in Inches |
|------------------------------------|-------------------------------------|------------------------|------------------------|---------------------------|------------------------|------------------------|---------------------------|------------------------|------------------------|---------------------------|--------------------------------|------------------------------|
| | | Rev. per Min. | | Pounds per Spindle. | Rev. per Min. | | Pounds per Spindle. | Rev. per Min. | | Pounds per Spindle. | | |
| | | 1 $\frac{3}{8}$ " Roll | 1 $\frac{1}{2}$ " Roll | | 1 $\frac{3}{8}$ " Roll | 1 $\frac{1}{2}$ " Roll | | 1 $\frac{3}{8}$ " Roll | 1 $\frac{1}{2}$ " Roll | | | |
| 6 | 4500 | 150.3 | 137.8 | 3.97 | 120.3 | 110.3 | 3.18 | 100.3 | 91.9 | 2.55 | 4 | 3 |
| 7 | 4750 | 147.0 | 134.8 | 3.33 | 117.6 | 107.8 | 2.67 | 98.0 | 89.8 | 2.42 | | |
| 8 | 5000 | 144.7 | 132.6 | 2.87 | 115.7 | 106.1 | 2.29 | 96.4 | 88.4 | 1.91 | | |
| 9 | 5200 | 141.8 | 130.0 | 2.50 | 113.4 | 104.0 | 2.01 | 94.6 | 86.7 | 1.67 | 3 | 2 |
| 10 | 5300 | 137.2 | 125.8 | 2.18 | 109.7 | 100.6 | 1.75 | 91.4 | 83.8 | 1.46 | | |
| 11 | 5500 | 135.8 | 124.5 | 1.96 | 108.5 | 99.5 | 1.57 | 90.5 | 83.0 | 1.30 | | |
| 12 | 5500 | 130.0 | 119.1 | 1.71 | 103.9 | 95.2 | 1.38 | 86.6 | 79.4 | 1.15 | 3 $\frac{1}{2}$ | 2 $\frac{1}{4}$ |
| 13 | 5650 | 128.2 | 117.5 | 1.57 | 102.6 | 94.1 | 1.25 | 85.5 | 78.4 | 1.05 | | |
| 14 | 5750 | 125.3 | 115.3 | 1.43 | 100.6 | 92.2 | 1.14 | 83.9 | 76.9 | 0.96 | | |
| 15 | 5900 | 124.7 | 114.3 | 1.31 | 99.8 | 91.5 | 1.06 | 83.0 | 76.1 | 0.88 | 3 $\frac{3}{4}$ | 2 $\frac{1}{4}$ |
| 16 | 6000 | 122.8 | 112.6 | 1.22 | 98.2 | 90.0 | 0.98 | 81.8 | 75.0 | 0.81 | | |
| 17 | 6000 | 119.1 | 109.2 | 1.12 | 95.2 | 87.3 | 0.89 | 79.4 | 72.8 | 0.74 | | |
| 18 | 6050 | 116.6 | 106.9 | 1.03 | 93.5 | 85.7 | 0.82 | 77.8 | 71.3 | 0.69 | 3 | 2 |
| 19 | 6100 | 114.5 | 105.0 | 0.96 | 91.6 | 84.0 | 0.77 | 76.4 | 70.0 | 0.64 | | |
| 20 | 6150 | 112.5 | 103.1 | 0.91 | 90.0 | 82.5 | 0.73 | 75.0 | 68.8 | 0.60 | | |
| 22 | 6300 | 109.9 | 100.7 | 0.80 | 87.9 | 80.6 | 0.64 | 73.3 | 67.2 | 0.54 | 2 $\frac{3}{4}$ | 1 $\frac{3}{4}$ |
| 24 | 6500 | 108.5 | 99.5 | 0.75 | 86.8 | 79.6 | 0.58 | 72.4 | 66.4 | 0.49 | | |
| 26 | 6550 | 106.7 | 97.8 | 0.66 | 85.4 | 78.3 | 0.53 | 71.2 | 65.3 | 0.44 | | |
| 28 | 6800 | 105.1 | 96.3 | 0.60 | 84.1 | 77.1 | 0.48 | 70.1 | 64.3 | 0.40 | 2 | 1 $\frac{3}{4}$ |
| 30 | 6800 | 103.0 | 94.4 | 0.55 | 82.4 | 75.5 | 0.44 | 68.7 | 63.0 | 0.37 | | |
| 32 | 7000 | 101.3 | 92.9 | 0.51 | 81.0 | 74.3 | 0.41 | 67.6 | 62.0 | 0.34 | | |
| 34 | 7000 | 98.2 | 90.0 | 0.46 | 78.5 | 72.0 | 0.37 | 65.5 | 60.0 | 0.31 | 2 $\frac{3}{4}$ | 1 $\frac{3}{4}$ |
| 36 | 7000 | 95.5 | 87.5 | 0.42 | 76.4 | 70.0 | 0.34 | 63.6 | 58.3 | 0.29 | | |
| 38 | 7000 | 92.9 | 85.2 | 0.39 | 74.3 | 68.1 | 0.32 | 61.9 | 56.7 | 0.26 | | |
| 40 | 7000 | 90.6 | 83.1 | 0.37 | 72.5 | 66.5 | 0.30 | 60.4 | 55.4 | 0.24 | 2 $\frac{3}{4}$ | 1 $\frac{3}{4}$ |
| 50 | 7500 | 86.8 | 79.6 | 0.28 | 69.4 | 63.6 | 0.22 | 57.9 | 53.1 | 0.19 | | |
| 60 | 7500 | 79.2 | 72.6 | 0.22 | 63.4 | 58.1 | 0.17 | 52.8 | 48.4 | 0.15 | | |
| 70 | 7500 | 73.4 | 67.3 | 0.18 | 58.7 | 53.8 | 0.14 | 48.9 | 44.8 | 0.12 | | |

Allowance has been made for waste, cleaning, oiling and doffing.

Table Showing Number Pounds Twisted Yarn Produced in Ten Hours.—3 Ply.

| No of Yarn to be Twisted. | Rev. of Spindle per Minute. | Multiplier 4. | | | Multiplier 5. | | | Multiplier 6. | | | Space of Frame in Inches | Dia. of Ring in Inches |
|------------------------------------|--------------------------------------|---------------|-------------|---------------------------|---------------|-------------|---------------------------|---------------|-------------|---------------------------|-----------------------------------|---------------------------------|
| | | Rev. per Min. | | Pounds per Spindle. | Rev. per Min. | | Pounds per Spindle. | Rev. per Min. | | Pounds per Spindle. | | |
| | | 1 1/2" Roll | 1 1/2" Roll | | 1 1/2" Roll | 1 1/2" Roll | | 1 1/2" Roll | 1 1/2" Roll | | | |
| 6 | 4000 | 163.6 | 150.0 | 6.48 | 130.9 | 120.0 | 5.18 | 109.1 | 100.0 | 4.33 | 4 1/2 | 3 3/4 |
| 7 | 4300 | 162.9 | 149.3 | 5.54 | 130.3 | 119.4 | 4.43 | 108.6 | 99.6 | 3.69 | | |
| 8 | 4550 | 161.2 | 147.8 | 4.80 | 129.1 | 118.3 | 3.83 | 107.5 | 98.5 | 3.20 | | |
| 9 | 4800 | 160.4 | 147.0 | 4.23 | 128.3 | 117.6 | 3.38 | 106.9 | 98.0 | 2.82 | 3 1/2 | 2 1/2 |
| 10 | 5000 | 158.6 | 145.4 | 3.77 | 126.7 | 116.2 | 3.02 | 105.7 | 96.9 | 2.51 | | |
| 11 | 5200 | 157.1 | 144.0 | 3.39 | 125.8 | 115.3 | 2.71 | 104.8 | 96.1 | 2.26 | | |
| 12 | 5350 | 154.8 | 141.9 | 3.07 | 123.8 | 113.5 | 2.46 | 103.2 | 94.6 | 2.05 | 4 | 3 |
| 13 | 5500 | 152.8 | 140.1 | 2.80 | 122.3 | 112.1 | 2.24 | 101.9 | 93.4 | 1.87 | | |
| 14 | 5600 | 150.0 | 137.5 | 2.54 | 120.0 | 110.0 | 2.03 | 100.0 | 91.7 | 1.69 | | |
| 15 | 5750 | 148.8 | 136.4 | 2.36 | 119.0 | 109.1 | 1.89 | 99.2 | 90.9 | 1.57 | 3 1/4 | 2 3/4 |
| 16 | 5850 | 146.6 | 134.4 | 2.18 | 117.2 | 107.4 | 1.74 | 97.7 | 89.6 | 1.45 | | |
| 17 | 5850 | 142.2 | 130.4 | 1.99 | 113.8 | 104.3 | 1.59 | 94.8 | 86.9 | 1.33 | | |
| 18 | 5950 | 140.5 | 128.8 | 1.86 | 112.4 | 103.0 | 1.49 | 93.7 | 85.9 | 1.24 | 3 1/4 | 2 1/4 |
| 19 | 6000 | 137.9 | 126.4 | 1.72 | 110.4 | 101.2 | 1.38 | 92.0 | 84.3 | 1.15 | | |
| 20 | 6000 | 134.5 | 123.3 | 1.60 | 107.6 | 98.6 | 1.28 | 89.7 | 82.2 | 1.07 | | |
| 22 | 6000 | 128.2 | 117.5 | 1.39 | 102.5 | 94.0 | 1.12 | 85.5 | 78.4 | 0.93 | 3 1/4 | 2 1/4 |
| 24 | 6000 | 122.8 | 112.6 | 1.22 | 98.2 | 90.0 | 0.98 | 81.9 | 75.1 | 0.81 | | |
| 26 | 6100 | 120.1 | 110.1 | 1.09 | 95.9 | 87.9 | 0.87 | 80.0 | 73.3 | 0.73 | | |
| 28 | 6250 | 118.4 | 108.5 | 1.01 | 94.7 | 86.8 | 0.81 | 78.9 | 72.3 | 0.67 | 3 1/4 | 2 1/4 |
| 30 | 6400 | 117.1 | 107.3 | 0.94 | 93.7 | 85.9 | 0.75 | 78.1 | 71.6 | 0.63 | | |
| 32 | 6500 | 115.2 | 105.6 | 0.86 | 92.1 | 84.4 | 0.69 | 76.8 | 70.4 | 0.57 | | |
| 34 | 6500 | 111.8 | 102.5 | 0.79 | 89.4 | 82.0 | 0.63 | 74.5 | 68.3 | 0.53 | 3 | 2 1/4 |
| 36 | 6500 | 108.5 | 99.5 | 0.73 | 86.9 | 79.7 | 0.58 | 72.4 | 66.4 | 0.49 | | |
| 38 | 6500 | 105.6 | 96.8 | 0.67 | 84.5 | 77.5 | 0.54 | 70.5 | 64.6 | 0.45 | | |
| 40 | 6500 | 102.9 | 94.3 | 0.62 | 82.4 | 75.5 | 0.50 | 68.7 | 63.0 | 0.41 | 3 | 2 1/4 |
| 50 | 7000 | 99.2 | 90.9 | 0.47 | 79.3 | 72.8 | 0.38 | 66.2 | 60.7 | 0.31 | | |
| 60 | 7000 | 90.5 | 83.0 | 0.37 | 72.5 | 66.5 | 0.30 | 60.4 | 55.4 | 0.25 | | |
| 70 | 7000 | 83.8 | 76.8 | 0.30 | 67.1 | 61.5 | 0.24 | 55.9 | 51.2 | 0.20 | | |

Allowance has been made for waste, cleaning, oiling and doffing.

Table Showing Number Pounds Twisted Yarn Produced in Ten Hours.—4 Ply.

| No. of Yarn to be Twisted. | Rev. of Spindle per Minute. | Multiplier 4. | | | Multiplier 5. | | | Multiplier 6. | | | Space of Frame in Inches | Dia. of King in Inches |
|-------------------------------------|--------------------------------------|---------------|-------------|-------------|---------------------------|---------------|-------------|---------------|--------------------------|------|--------------------------------|------------------------------|
| | | Rev. per Min. | | | Pounds per Spindle. | Rev. per Min. | | | Pounds per Spindle | | | |
| | | 1 1/2" Roll | 1 1/2" Roll | 1 1/2" Roll | | 1 1/2" Roll | 1 1/2" Roll | 1 1/2" Roll | | | | |
| 6 | 3500 | 105.3 | 151.5 | 8.73 | 132.3 | 121.3 | 6.98 | 110.2 | 101.0 | 5.82 | 4 | |
| 7 | 3750 | 103.2 | 149.0 | 7.39 | 131.3 | 120.4 | 5.95 | 109.3 | 100.2 | 4.95 | | |
| 8 | 3950 | 101.5 | 148.0 | 6.40 | 129.3 | 118.5 | 5.13 | 107.7 | 98.7 | 4.27 | | |
| 9 | 4100 | 158.2 | 145.0 | 5.57 | 126.5 | 116.0 | 4.46 | 105.5 | 96.7 | 3.72 | | |
| 10 | 4300 | 157.5 | 144.4 | 4.99 | 125.8 | 115.3 | 3.99 | 104.9 | 96.2 | 3.33 | | |
| 11 | 4450 | 155.4 | 142.5 | 4.48 | 124.3 | 113.9 | 3.58 | 103.5 | 94.9 | 2.98 | | |
| 12 | 4600 | 153.7 | 140.9 | 4.07 | 123.0 | 112.8 | 3.25 | 102.5 | 94.0 | 2.71 | | |
| 13 | 4700 | 151.0 | 138.4 | 3.69 | 120.8 | 110.7 | 2.94 | 100.6 | 92.2 | 2.46 | 4 1/2 | |
| 14 | 4800 | 148.5 | 136.1 | 3.36 | 118.8 | 108.9 | 2.69 | 99.0 | 90.8 | 2.24 | | |
| 15 | 4900 | 146.3 | 134.1 | 3.09 | 117.2 | 107.4 | 2.48 | 97.6 | 89.5 | 2.06 | | |
| 16 | 5000 | 144.7 | 132.6 | 2.87 | 115.7 | 106.1 | 2.29 | 96.4 | 88.4 | 1.91 | | |
| 17 | 5100 | 143.1 | 131.2 | 2.67 | 114.5 | 105.0 | 2.13 | 95.4 | 87.5 | 1.78 | 3 1/2 | |
| 18 | 5200 | 141.7 | 129.9 | 2.50 | 113.4 | 104.0 | 2.00 | 94.5 | 86.6 | 1.67 | | |
| 19 | 5250 | 139.3 | 127.7 | 2.32 | 111.5 | 102.2 | 1.86 | 92.9 | 85.2 | 1.55 | 4 | |
| 20 | 5300 | 137.2 | 125.8 | 2.18 | 109.7 | 100.6 | 1.75 | 91.4 | 83.8 | 1.45 | | |
| 22 | 5450 | 134.5 | 123.3 | 1.94 | 107.6 | 98.6 | 1.55 | 89.7 | 82.2 | 1.29 | | |
| 24 | 5600 | 132.2 | 121.2 | 1.75 | 105.8 | 97.0 | 1.40 | 88.2 | 80.9 | 1.17 | | |
| 26 | 5700 | 129.4 | 118.6 | 1.58 | 103.5 | 94.9 | 1.26 | 86.2 | 79.0 | 1.05 | 2 1/2 | |
| 28 | 5800 | 127.0 | 116.4 | 1.44 | 101.5 | 93.0 | 1.15 | 84.6 | 77.6 | 0.96 | | |
| 30 | 5900 | 124.7 | 114.3 | 1.31 | 99.8 | 91.5 | 1.05 | 83.1 | 76.2 | 0.87 | 3 1/2 | |
| 32 | 5950 | 121.8 | 111.7 | 1.21 | 97.4 | 89.3 | 0.97 | 81.2 | 74.4 | 0.81 | | |
| 34 | 6000 | 119.1 | 109.2 | 1.12 | 95.2 | 87.3 | 0.90 | 79.4 | 72.8 | 0.75 | | |
| 36 | 6050 | 116.7 | 107.0 | 1.03 | 93.4 | 85.6 | 0.82 | 77.8 | 71.3 | 0.69 | 2 | |
| 38 | 6100 | 114.5 | 105.0 | 0.96 | 91.6 | 84.0 | 0.77 | 76.4 | 70.0 | 0.64 | 3 | |
| 40 | 6100 | 111.6 | 102.3 | 0.89 | 89.3 | 81.9 | 0.71 | 74.4 | 68.2 | 0.60 | | |
| 50 | 6450 | 105.6 | 96.8 | 0.67 | 84.5 | 77.5 | 0.54 | 70.4 | 64.5 | 0.45 | 2 3/4 | |
| 60 | 6750 | 100.9 | 92.5 | 0.54 | 80.7 | 74.0 | 0.43 | 67.2 | 61.6 | 0.36 | 1 3/4 | |
| 70 | 6900 | 95.4 | 87.5 | 0.44 | 76.4 | 70.0 | 0.35 | 63.6 | 58.3 | 0.29 | | |

Allowance has been made for waste, cleaning, oiling and doffing.

Table Showing Number Pounds Twisted Yarn Produced in Ten Hours.—5 Ply.

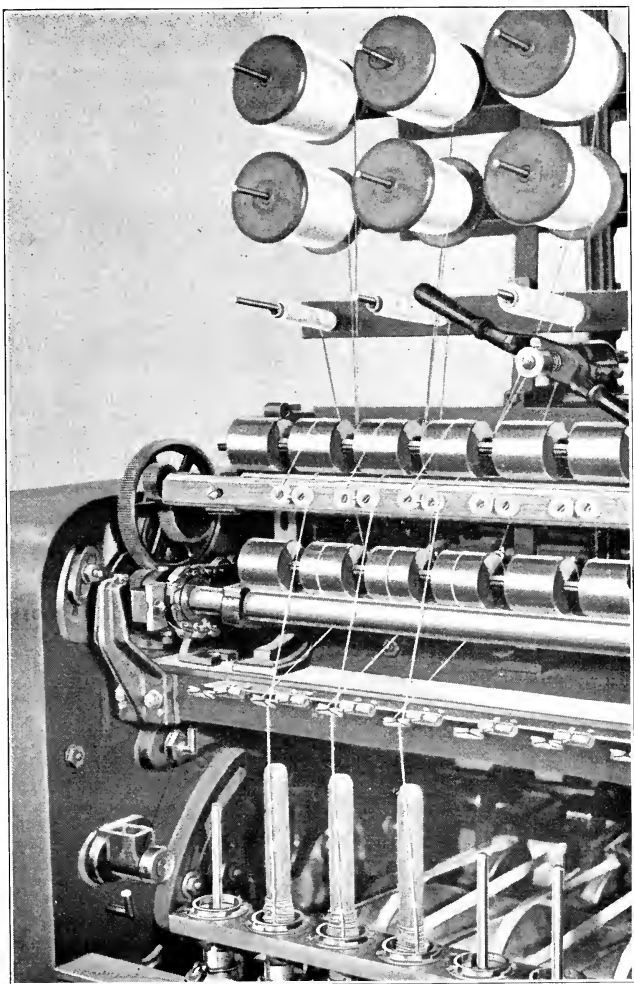
| No. of Yarn to be Twisted | Multiplier 4. | | | Multiplier 5. | | | Multiplier 6. | | | Space of Frame in Inches | Dia. of Ring in Inches |
|---------------------------|-----------------------------|---------------|-------------|---------------------|---------------|-------------|---------------------|---------------|-------------|--------------------------|------------------------|
| | Rev. of Spindle per Minute. | Rev. per Min. | | Pounds per Spindle. | Rev. per Min. | | Pounds per Spindle. | Rev. per Min. | | Space of Frame in Inches | Dia. of Ring in Inches |
| | | 1 1/2" Roll | 1 1/2" Roll | | 1 1/2" Roll | 1 1/2" Roll | | 1 1/2" Roll | 1 1/2" Roll | | |
| 6 | 2800 | 148.0 | 135.7 | 9.77 | 118.3 | 108.4 | 7.81 | 98.7 | 90.5 | 5 1/2 | 4 1/2 |
| 7 | 3000 | 146.8 | 134.6 | 8.31 | 117.3 | 107.5 | 6.64 | 97.8 | 89.7 | | |
| 8 | 3150 | 144.1 | 132.1 | 7.13 | 115.4 | 105.8 | 5.71 | 96.1 | 88.1 | | |
| 9 | 3300 | 142.2 | 130.4 | 6.26 | 113.8 | 104.3 | 5.01 | 94.9 | 87.0 | 5 | 4 |
| 10 | 3400 | 139.1 | 127.5 | 5.51 | 111.3 | 102.0 | 4.41 | 92.7 | 85.0 | | |
| 11 | 3550 | 138.6 | 127.1 | 4.99 | 110.8 | 101.6 | 3.99 | 92.4 | 84.7 | | |
| 12 | 3650 | 136.3 | 124.9 | 4.50 | 109.0 | 99.9 | 3.60 | 90.8 | 83.2 | | |
| 13 | 3750 | 134.6 | 123.4 | 4.10 | 107.7 | 98.7 | 3.29 | 89.8 | 82.3 | | |
| 14 | 3800 | 131.5 | 120.5 | 3.72 | 105.1 | 96.3 | 2.98 | 87.6 | 80.3 | | |
| 15 | 3900 | 130.3 | 119.4 | 3.44 | 104.3 | 95.6 | 2.75 | 86.8 | 79.6 | | |
| 16 | 3950 | 127.7 | 117.1 | 3.16 | 102.2 | 93.7 | 2.53 | 85.2 | 78.1 | | |
| 17 | 4000 | 125.5 | 115.0 | 2.93 | 100.4 | 92.0 | 2.34 | 83.7 | 76.7 | | |
| 18 | 4050 | 123.5 | 113.2 | 2.72 | 98.8 | 90.6 | 2.18 | 82.4 | 75.5 | | |
| 19 | 4100 | 121.7 | 111.6 | 2.54 | 97.3 | 89.2 | 2.03 | 81.1 | 74.3 | 4 1/2 | 3 1/2 |
| 20 | 4150 | 120.1 | 110.1 | 2.38 | 96.1 | 88.1 | 1.90 | 80.1 | 73.4 | | |
| 22 | 4200 | 116.2 | 106.5 | 2.09 | 92.7 | 85.0 | 1.67 | 77.2 | 70.8 | | |
| 24 | 4300 | 113.6 | 104.1 | 1.88 | 90.9 | 83.3 | 1.50 | 75.7 | 69.4 | | |
| 26 | 4350 | 110.4 | 101.2 | 1.68 | 88.3 | 80.9 | 1.34 | 73.6 | 67.5 | | |
| 28 | 4400 | 107.6 | 98.6 | 1.52 | 86.1 | 78.9 | 1.22 | 71.7 | 65.6 | | |
| 30 | 4500 | 106.3 | 97.4 | 1.41 | 85.1 | 78.0 | 1.13 | 70.9 | 65.0 | | |
| 32 | 4550 | 104.1 | 95.4 | 1.29 | 83.3 | 76.4 | 1.03 | 69.4 | 63.6 | | |
| 34 | 4600 | 102.1 | 93.6 | 1.19 | 81.7 | 74.9 | 0.95 | 68.0 | 62.3 | 4 | 3 |
| 36 | 4600 | 99.2 | 90.9 | 1.09 | 79.4 | 72.8 | 0.87 | 66.1 | 60.6 | | |
| 38 | 4600 | 96.6 | 88.7 | 1.01 | 77.3 | 70.9 | 0.81 | 64.4 | 59.0 | | |
| 40 | 4600 | 94.1 | 86.3 | 0.93 | 75.3 | 69.0 | 0.74 | 62.7 | 57.5 | | |
| 50 | 4900 | 89.7 | 82.2 | 0.72 | 71.7 | 65.7 | 0.58 | 59.8 | 54.8 | | |
| 60 | 5200 | 86.8 | 79.6 | 0.46 | 69.5 | 63.7 | 0.46 | 57.9 | 53.1 | 3 1/2 | 2 1/2 |
| 70 | 5450 | 84.3 | 77.3 | 0.38 | 67.4 | 61.8 | 0.38 | 56.2 | 51.5 | | |

Allowance has been made for waste, cleaning, oiling and doffing.

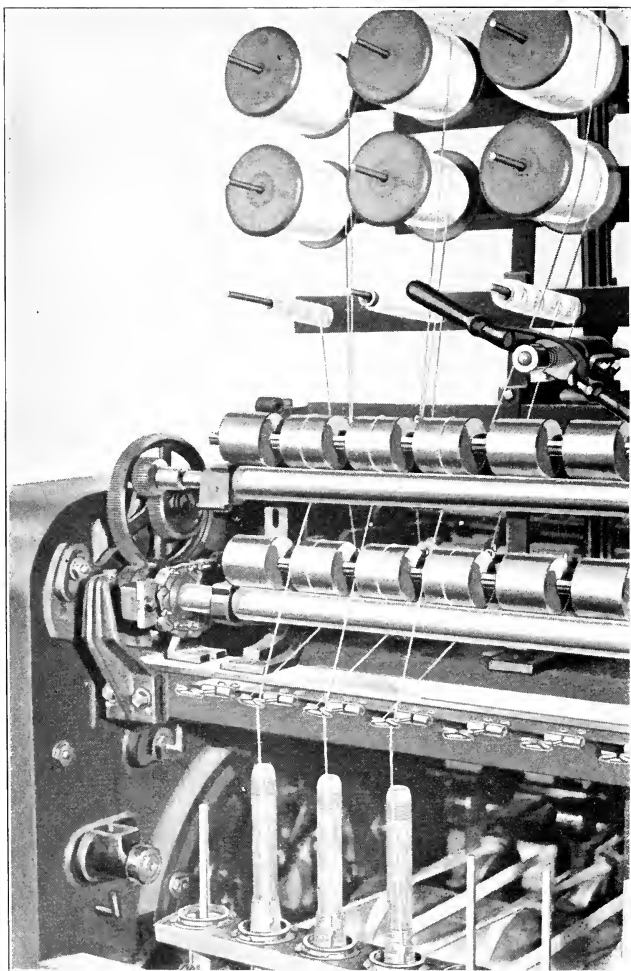
Table Showing Number Pounds Twisted Yarn Produced in Ten Hours.—6 Ply.

| No of Yarn to be Twisted. | Rev. of Spindle per Minute. | Multiplier 4. | | | Multiplier 5. | | | Multiplier 6. | | | Space of Frame in Inches | Dia. of Ring in Inches |
|------------------------------------|--------------------------------------|------------------------|------------------------|---------------------------|------------------------|------------------------|---------------------------|------------------------|------------------------|---------------------------|--------------------------------|------------------------------|
| | | Rev. per Min. | | Pounds per Spindle. | Rev. per Min. | | Pounds per Spindle. | Rev. per Min. | | Pounds per Spindle. | | |
| | | 1 $\frac{3}{8}$ " Roll | 1 $\frac{1}{2}$ " Roll | | 1 $\frac{3}{8}$ " Roll | 1 $\frac{1}{2}$ " Roll | | 1 $\frac{3}{8}$ " Roll | 1 $\frac{1}{2}$ " Roll | | | |
| 6 | 2400 | 138.9 | 127.3 | 11.00 | 111.1 | 101.8 | 8.80 | 92.6 | 84.9 | 7.34 | 4 $\frac{1}{2}$ | |
| 7 | 2550 | 136.7 | 125.3 | 9.28 | 109.3 | 100.2 | 7.42 | 91.1 | 83.5 | 6.19 | 5 | |
| 8 | 2700 | 135.3 | 124.0 | 8.04 | 108.4 | 99.4 | 6.44 | 90.2 | 82.7 | 5.26 | | |
| 9 | 2850 | 134.6 | 123.4 | 7.13 | 107.8 | 98.8 | 5.70 | 89.8 | 82.3 | 4.55 | | |
| 10 | 2950 | 132.3 | 121.3 | 6.29 | 105.9 | 97.1 | 5.03 | 88.1 | 80.8 | 4.19 | | |
| 11 | 3050 | 130.3 | 119.4 | 5.64 | 104.3 | 95.6 | 4.51 | 86.9 | 79.7 | 3.76 | | |
| 12 | 3150 | 128.8 | 118.1 | 5.10 | 103.1 | 94.5 | 4.08 | 85.9 | 78.7 | 3.40 | 4 $\frac{1}{2}$ | |
| 13 | 3250 | 127.7 | 117.6 | 4.68 | 102.2 | 93.7 | 3.74 | 85.2 | 78.1 | 3.12 | | |
| 14 | 3350 | 126.9 | 116.3 | 4.31 | 101.5 | 93.0 | 3.40 | 84.6 | 77.6 | 2.88 | | |
| 15 | 3450 | 126.4 | 115.9 | 4.00 | 101.0 | 92.6 | 3.20 | 84.2 | 77.2 | 2.67 | | |
| 16 | 3550 | 125.8 | 115.3 | 3.74 | 100.7 | 92.3 | 2.99 | 83.9 | 76.9 | 2.49 | | |
| 17 | 3600 | 125.8 | 115.3 | 3.46 | 99.0 | 90.8 | 2.77 | 82.5 | 75.6 | 2.31 | 3 $\frac{1}{2}$ | |
| 18 | 3650 | 124.9 | 114.7 | 3.23 | 97.6 | 89.5 | 2.58 | 81.3 | 74.5 | 2.15 | | |
| 19 | 3700 | 120.3 | 110.3 | 3.01 | 96.2 | 88.2 | 2.41 | 80.2 | 73.5 | 2.01 | | |
| 20 | 3750 | 118.9 | 109.0 | 2.83 | 95.1 | 87.2 | 2.26 | 79.3 | 72.7 | 1.88 | | |
| 22 | 3850 | 116.3 | 106.6 | 2.51 | 93.1 | 85.3 | 2.01 | 77.6 | 71.1 | 1.68 | | |
| 24 | 4000 | 115.7 | 106.1 | 2.30 | 92.6 | 84.9 | 1.84 | 77.2 | 70.8 | 1.58 | 4 | |
| 26 | 4050 | 112.5 | 103.1 | 2.06 | 90.1 | 82.6 | 1.65 | 75.1 | 68.8 | 1.38 | | |
| 28 | 4100 | 109.8 | 100.6 | 1.86 | 87.9 | 80.6 | 1.49 | 73.2 | 67.1 | 1.24 | | |
| 30 | 4150 | 107.4 | 98.5 | 1.70 | 85.9 | 78.7 | 1.36 | 71.6 | 65.6 | 1.13 | | |
| 32 | 4200 | 105.2 | 96.4 | 1.56 | 84.2 | 77.2 | 1.25 | 70.1 | 64.3 | 1.04 | | |
| 34 | 4200 | 102.1 | 93.6 | 1.43 | 81.7 | 74.9 | 1.14 | 68.1 | 62.4 | 0.95 | 3 $\frac{1}{2}$ | |
| 36 | 4250 | 100.4 | 92.0 | 1.32 | 80.3 | 73.6 | 1.06 | 66.9 | 61.3 | 0.88 | | |
| 38 | 4250 | 97.7 | 89.6 | 1.23 | 78.2 | 71.7 | 0.98 | 65.2 | 59.8 | 0.82 | | |
| 40 | 4250 | 93.4 | 85.6 | 1.14 | 76.2 | 69.9 | 0.91 | 63.5 | 58.2 | 0.76 | | |
| 50 | 4550 | 91.2 | 83.6 | 0.87 | 73.0 | 66.9 | 0.70 | 60.8 | 55.7 | 0.58 | | |
| 60 | 4750 | 86.9 | 79.7 | 0.70 | 69.5 | 63.7 | 0.56 | 58.0 | 53.2 | 0.47 | 3 | |
| 70 | 4950 | 83.9 | 76.9 | 0.58 | 67.1 | 61.5 | 0.46 | 55.9 | 51.2 | 0.38 | | |

Allowance has been made for waste, cleaning, oiling and doffing.

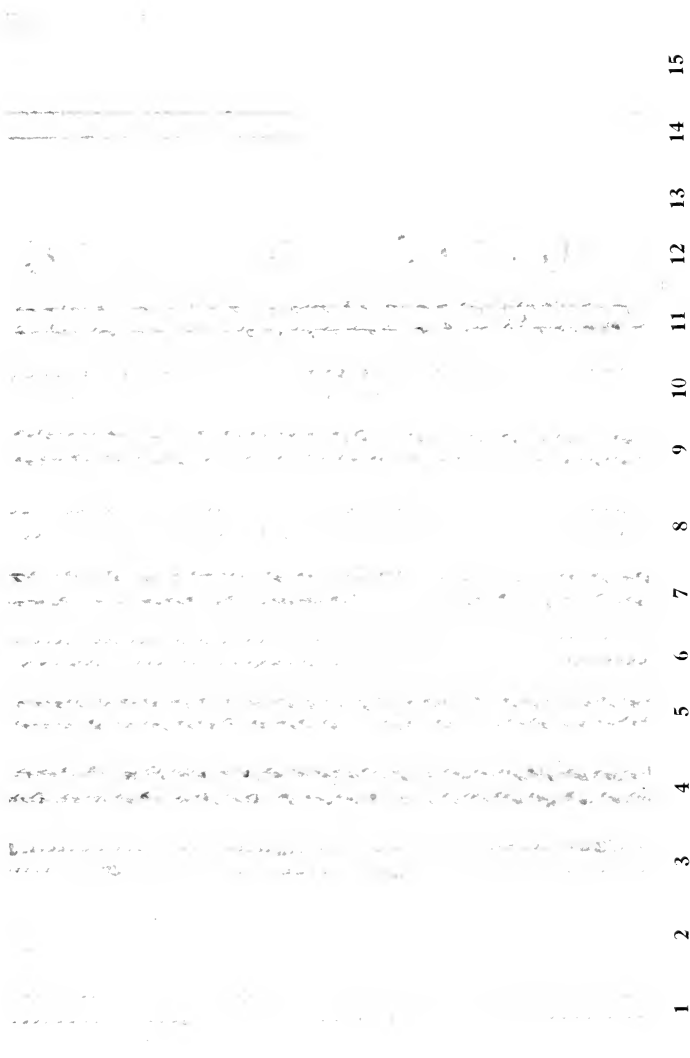


**Fancy Yarn Machine
with Tension Bar**



**Fancy Yarn Machine
without Tension Bar**

Fancy Yarns



FANCY YARNS

In the manufacture of some varieties of dress goods **fancy yarns** are sometimes required. These yarns are composed usually of two or more threads twisted together in a predetermined manner to give the desired effect in the cloth being woven.

The component parts of a fancy yarn may differ in a number of features, viz.: counts, quality of material, twist per inch, direction of twist, and delivery ratio of the different components. A good knowledge of yarns and the influence of twist on yarns compounded together is necessary to obtain satisfactory results.

There is a large variety of fancy yarns in demand by manufacturers, some of which we illustrate on preceding page, wherein Nos. 1, 2 and 3 show nub yarns; Nos. 4, 5, 6, 7, 8, 9, 10, 11, and 12 show various forms of ratine or loop yarns; and 13, 14 and 15 are flake yarns.

Where a small quantity of yarn is required these yarns may be made, in an economical manner, on the ordinary spinning and twisting frames, by proper manipulation of the gearing, rolls and guides; but where a larger quantity is required, it is advisable to employ a machine specially fitted for the purpose. With this object in view, we have designed and placed on the market our Fancy Yarn Machine which has proven, by repeated installation, to be particularly adapted for the manufacture of many styles of fancy yarns.

As will be seen by reference to the illustrations on pages 257 and 258 the machine comprises two sets of rolls one above the other held in bearings fastened to rigid uprights bolted to the roll beam of the ordinarily constructed twisting frame. The upper set of rolls delivers the main thread to a guide and thence through traveler and ring to the twisting spindle, while the lower set of rolls delivers the auxiliary thread, which forms the nubs

or bunches on the main thread, by winding thereon at predetermined intervals. The upper rolls have an intermittent rotary motion, thus varying the delivery of the main thread, whilst the lower rolls have a continuous rotary motion delivering the auxiliary thread through a guide and thence being wound onto the main thread forming a bunch at each stoppage of the upper rolls and then being twisted into the main thread in the spaces between the bunches.

The relative movements of the two sets of rolls are controlled by means of a travelling pattern chain made up of a number of low links with one or more riser links. The riser links acting in conjunction with a shifting lever disengages the clutch which transmits motion from the lower rolls to the upper rolls, thus stopping the delivery of the main thread; consequently, the auxiliary thread, whose delivery is continuous, is twisted into a bunch on the main thread, the size of the bunch depending on the duration of the disengagement of the clutch.

By varying the length of the chain and the number and positions of the riser links, a large variety of combinations may be had.

In some types of fancy yarn it is of the greatest importance that the main thread be delivered under a proper tension in order to derive desired results. Where this is desired, the machine may be provided with porcelain knobs fastened to a wooden bar located in front of the upper set of rolls (see page 257.) The requisite tension is imparted to the thread by one or more turns about the knobs.

The machine as above described is only adapted for making nub and flake yarns, but by disconnecting the chain, thus continuously running both set of rolls at requisite delivery ratios and using proper arrangements of thread guides with particular attention given to the tension and twist, other styles of fancy yarns may be readily made.

For the information of those having to do with the operation of our Fancy Yarn Machine we present in the following pages, data on yarns used

and gears required in producing some of the fancy yarns shown on page 259. We hope this will afford sufficient information to enable anyone to approximately calculate the necessary yarn components and gearing required for producing their particular yarn requirements.

No. 1 Nub Yarn

Components $\left\{ \begin{array}{l} 2 \text{ ends } 15\text{'s main yarn} \\ 1 \text{ end } 15\text{'s auxiliary yarn} \end{array} \right.$

Gearing:

Crown Gear, 168 teeth Bottom Roll Gear, 60 teeth.
Change Gear, 84 teeth Top Roll Gear, 42 teeth.

Twist: 26 turns per inch.

Pattern Chain: 5 low links, 1 riser and repeat.

No. 3 Nub Yarn

Components $\left\{ \begin{array}{l} 2 \text{ ends } 15\text{'s main yarn} \\ 1 \text{ end } 15\text{'s auxiliary yarn} \end{array} \right.$

Gearing:

Crown Gear, 168 teeth Bottom Roll Gear, 60 teeth.
Change Gear 84 teeth Top Roll Gear, 42 teeth.

Twist: 23 turns per inch

Pattern Chain: 5 low links, 3 risers and repeat.

No. 4 Ratine Yarn

First Operation:

Components $\left\{ \begin{array}{l} 2 \text{ ends } 16\text{'s main yarn} \\ 1 \text{ end } 16\text{'s auxiliary yarn} \end{array} \right.$

Gearing:

Crown Gear, 168 teeth Bottom Roll Gear, 60 teeth.
Change Gear, 52 teeth Top Roll Gear, 42 teeth.

Pattern Chain not required

Right Hand Twist: 20 turns per inch

Second Operation

One end of the first operation twisted 7 turns to the inch left hand with one end 16's as a binder. This may be done by running the work through the lower set of rolls.

No. 11 Ratine Yarn

First Operation:

Components $\left\{ \begin{array}{l} 2 \text{ ends } 30\text{'s } 2\text{-ply, main yarn.} \\ 2 \text{ ends } 30\text{'s } 2\text{-ply, auxiliary yarn.} \end{array} \right.$

Gearing

Crown Gear, 168 teeth Bottom Roll Gear, 60 teeth.
Change Gear, 52 teeth Top Roll Gear, 42 teeth.

Pattern Chain not required.

Right Hand Twist: 18 turns per inch.

Second Operation:

One end of the first operation twisted 7 turns per inch left hand with one end 30's as a binder.

No. 15 Flake Yarn

Components $\left\{ \begin{array}{l} 2 \text{ ends } 30\text{'s drawn through bottom rolls.} \\ 1 \text{ end } 2 \text{ hank roving drawn through top rolls.} \end{array} \right.$

Gearing:

Crown Gear, 168 teeth Bottom Roll Gear, 60 teeth.
Change Gear, 40 teeth Top Roll Gear, 42 teeth.

Pattern Chain: 5 low links, 3 risers and repeat.

Left hand Twist: 9 turns per inch.

No. 14 Flake Yarn

Components { 2 ends 16's drawn through bottom rolls.
 } 2 ends 4 hank roving drawn through top rolls.

Gearing:

Crown Gear, 168 teeth Bottom Roll Gear, 60 teeth.
Change Gear, 40 teeth Top Roll Gear, 42 teeth.

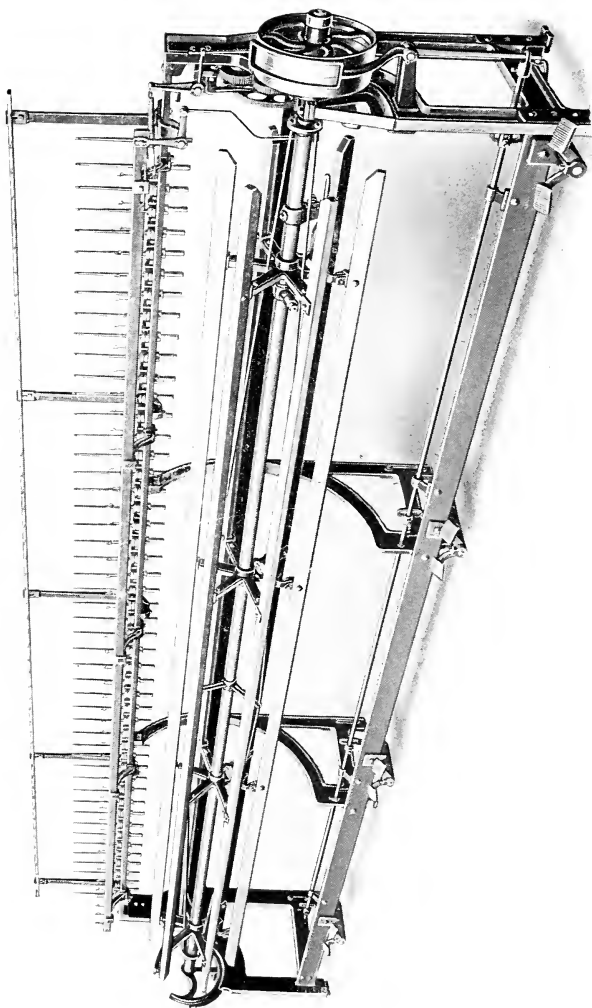
Pattern Chain: 5 low links, 4 risers and repeat

Left Hand Twist: 7 turns per inch.

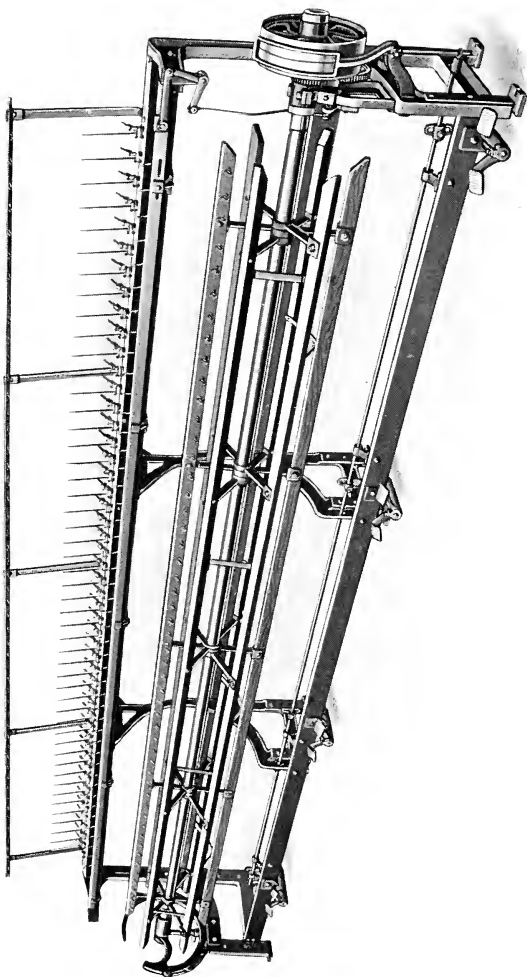
NOTE:—In making flake yarn it is necessary to use a small pressure roll on the top-roll of the lower set of rolls.

Our fancy yarn mechanism may be readily applied to old twistors of our make.

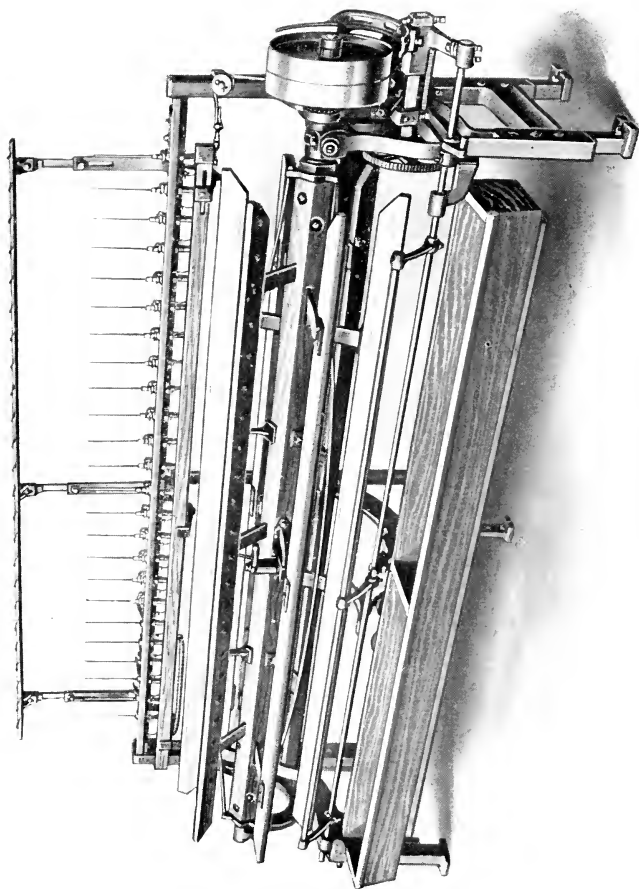
REELING



Model D Reel



Model E Reel



Model F Reel

WHITIN REELS

To satisfy the demands of Textile manufacturers who desire to wind their yarns into hanks or skeins for the requirements of bleaching, dyeing, mercerizing or re-winding processes, we build three types of Reels, viz:

Model D, Model E and Model F, differing from one another in designs of frames and construction of swifts.


MODEL D

This machine is equipped with a swift comprising six slats held by adjustable arms mounted on an iron shaft revoluble in bearings at the ends of the machine. Skeins of 54 inches, 60 inches, 72 inches and 90 inches in circumference may be had as desired. The skeins are loosened from the swift by depressing two adjacent slats after which the yarn may be removed from the machine by means of the well known "wheel" method of doffing.

MODEL E

The swift of this machine is adjustable for 54 inch, 60 inch or 72 inch skeins.

The adjustable arms are held on an iron shaft, two of the arms being in a swinging relation with the shaft whereby the skeins may be loosened for doffing by the "wheel" method.



Model F Doffing Gate

MODEL F

This machine differs from the others in that the swift is made of six slats held by wooden arms connected to a wooden shaft. The arms of two of the slats are pivoted to the shaft so that these slats may be depressed thus furnishing means for loosening the skeins which may then be removed by the "gate" method of doffing. The swift is non-adjustable but is made in two sizes, viz: 54 inches and 60 inches.

The following features are common to all three types of machines:

The frames of the machines are of rigid construction, the ends and sampsons of which being tied together by substantial girts of iron so that the heaviest yarns may be reeled at the highest practical speeds with a minimum of vibration in the frame of the machine.

The spindles for the usual equipment of the machines are provided with a uniform friction arrangement which imparts an even drag or tension to the yarn, but if so ordered an adjustable tensioning means will be furnished.

The yarn **traverse motion** may be either the plain or cross type. In cross reeling the yarn is wound on the swift in a diamond form, each layer being laid uniformly on top of the preceding layer, thus preventing entanglement during subsequent processes.

A measuring attachment may be had whereby the machine automatically stops when any predetermined number of yards have been reeled.

Bobbin boxes are furnished when ordered.



Model F Measuring Attachment.

The driving pulleys are 12 inches in diameter by 2 inches face and run from 100 to 175 revolutions per minute according to the size of skein and number of yarn. The machine may be arranged to be driven by an electric motor.

Horse Power: Approximately 300 spindles per horse power.

Floor Space: Width overall 26 inches, length according to number spindles and space, see table below.

Weights per foot in length:

Domestic:

Net, 59 pounds.

Gross, 78 pounds.

Export:

Gross, 89 pounds.

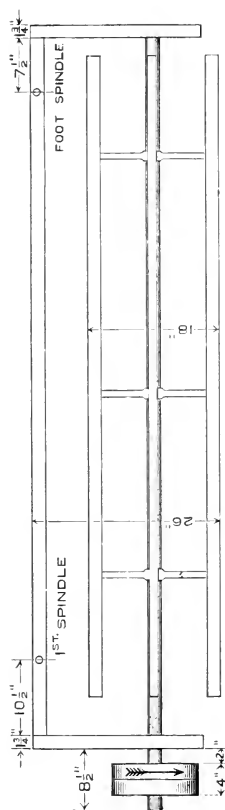
Cubic feet, 3.6.

FLOOR SPACE OF MODEL E REELS

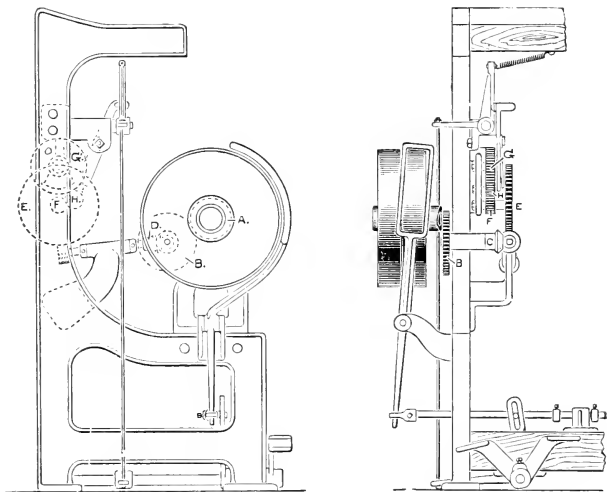
| No. of Spindles | 2 7/8 in. Space. | | 3 in. Space. | | 3 1/4 in. Space. | | 3 1/2 in. Space. | | 3 3/4 in. Space. | | 4 in. Space. | | No. of Spindles |
|--------------------|---------------------|--------|-----------------|-----|---------------------|--------|---------------------|--------|---------------------|--------|-----------------|-----|--------------------|
| | ft. | in. | ft. | in. | ft. | in. | ft. | in. | ft. | in. | ft. | in. | |
| 30 | | | | | | | 11 | 6 1/2 | 11 | 6 3/4 | 12 | 2 | 30 |
| 32 | | | | | | | 12 | 2 1/4 | 12 | 2 1/4 | 12 | 10 | 32 |
| 34 | | | | | 11 | 5 1/4 | 12 | 1 1/2 | 12 | 9 3/4 | 13 | 6 | 34 |
| 36 | | | 11 | 3 | 11 | 11 3/4 | 12 | 8 1/2 | 13 | 5 1/4 | 14 | 2 | 36 |
| 38 | | | 11 | 9 | 12 | 6 1/4 | 13 | 3 1/2 | 14 | 9 3/4 | 14 | 10 | 38 |
| 40 | 11 | 5 1/4 | 12 | 3 | 13 | 9 3/4 | 13 | 10 1/2 | 14 | 8 1/4 | 15 | 6 | 40 |
| 42 | 11 | 10 3/4 | 12 | 9 | 13 | 7 1/4 | 14 | 5 1/2 | 15 | 3 3/4 | 16 | 2 | 42 |
| 44 | 12 | 4 1/2 | 13 | 3 | 14 | 13 1/4 | 15 | 0 1/2 | 15 | 11 1/4 | | | 44 |
| 46 | 12 | 9 3/4 | 13 | 9 | 14 | 8 1/4 | 15 | 7 1/2 | | | | | 46 |
| 48 | 13 | 3 1/2 | 14 | 3 | 15 | 2 3/4 | 16 | 2 1/2 | | | | | 48 |
| 50 | 13 | 8 3/4 | 14 | 9 | 15 | 9 1/4 | | | | | | | 50 |
| 52 | 14 | 2 1/4 | 15 | 3 | 16 | 3 3/4 | | | | | | | 52 |
| 54 | 14 | 7 3/4 | 15 | 9 | | | | | | | | | 54 |
| 56 | 15 | 1 1/2 | 16 | 3 | | | | | | | | | 56 |
| 58 | 15 | 6 3/4 | | | | | | | | | | | 58 |
| 60 | 16 | 0 1/4 | | | | | | | | | | | 60 |

Model D Reel 2 1/4 inches longer.

“ F “ 3/4 “ “



FLOOR PLAN OF REEL



STOP-MOTION DIAGRAM
OF
MODELS D AND E REELS

Change Gear Tables

For Models D and E

Stop Motions

Plain Traverse.

| Yds. | A | B | D | F | G | H | 54" Reel. | | 60" Reel. | | 72" Reel. | | 90" Reel. | |
|------|----|----|----|----|----|----|-----------|-----|-----------|-----|-----------|----|-----------|----|
| | | | | | | | C | E | C | E | C | E | C | E |
| 120 | 38 | 63 | 20 | 42 | 16 | 21 | 21 | 133 | 20 | 114 | 20 | 95 | 20 | 76 |
| 240 | 38 | 63 | 20 | 21 | 16 | 42 | 21 | 133 | 20 | 114 | 20 | 95 | 20 | 76 |
| 360 | 38 | 63 | 20 | 21 | 24 | 42 | 21 | 133 | 20 | 114 | 20 | 95 | 20 | 76 |
| 480 | 38 | 63 | 20 | 21 | 32 | 42 | 21 | 133 | 20 | 114 | 20 | 95 | 20 | 76 |
| 600 | 38 | 63 | 20 | 21 | 40 | 42 | 21 | 133 | 20 | 114 | 20 | 95 | 20 | 76 |
| 720 | 38 | 63 | 20 | 21 | 48 | 42 | 21 | 133 | 20 | 114 | 20 | 95 | 20 | 76 |
| 840 | 38 | 63 | 20 | 21 | 56 | 42 | 21 | 133 | 20 | 114 | 20 | 95 | 20 | 76 |

Gears F and H are interchangeable.

This Motion cannot be used on Cross Traverse.

Cross Traverse.

| Yds. | A | B | F | G | H | 54" Reel. | | | 60" Reel. | | | 72" Reel. | | | 90" Reel. | | |
|------|----|----|----|----|----|-----------|----|-----|-----------|----|-----|-----------|----|-----|-----------|----|-----|
| | | | | | | C | D | E | C | D | E | C | D | E | C | D | E |
| 120 | 42 | 91 | 42 | 16 | 21 | 26 | 20 | 126 | 26 | 21 | 108 | 39 | 21 | 135 | 39 | 21 | 108 |
| 240 | 42 | 91 | 21 | 16 | 42 | 26 | 20 | 126 | 26 | 21 | 108 | 39 | 21 | 135 | 39 | 21 | 108 |
| 360 | 42 | 91 | 21 | 24 | 42 | 26 | 20 | 126 | 26 | 21 | 108 | 39 | 21 | 135 | 39 | 21 | 108 |
| 480 | 42 | 91 | 21 | 32 | 42 | 26 | 20 | 126 | 26 | 21 | 108 | 39 | 21 | 135 | 39 | 21 | 108 |
| 600 | 42 | 91 | 21 | 40 | 42 | 26 | 20 | 126 | 26 | 21 | 108 | 39 | 21 | 135 | 39 | 21 | 108 |
| 720 | 42 | 91 | 21 | 48 | 42 | 26 | 20 | 126 | 26 | 21 | 108 | 39 | 21 | 135 | 39 | 21 | 108 |
| 840 | 42 | 91 | 21 | 56 | 42 | 26 | 20 | 126 | 26 | 21 | 108 | 39 | 21 | 135 | 39 | 21 | 108 |

Gears F and H are interchangeable.

This Motion cannot be used on Plain Traverse.

Reel Production Tables.

| 54 IN. REEL. Revolutions per Minute. | | | | | | | | 60 IN. REEL. Revolutions per Minute. | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|--|---|-------|-------|-------|-------|-------|--------------|--|
| No. Yarn. | 125 | 130 | 135 | 140 | 145 | 150 | | 120 | 125 | 130 | 135 | 140 | 145 | No. Yarn. | |
| 1 | 50.22 | 52.24 | 54.24 | 56.25 | 58.26 | 60.27 | | 53.57 | 55.81 | 58.04 | 60.27 | 62.50 | 64.74 | 1 | |
| 2 | 25.11 | 26.12 | 27.12 | 28.12 | 29.13 | 30.14 | | 26.79 | 27.91 | 29.02 | 30.14 | 31.25 | 32.37 | 2 | |
| 3 | 16.74 | 17.41 | 18.08 | 18.75 | 19.42 | 20.09 | | 17.86 | 18.60 | 19.35 | 20.09 | 20.84 | 21.58 | 3 | |
| 4 | 12.55 | 13.06 | 13.56 | 14.07 | 14.57 | 15.07 | | 13.40 | 13.95 | 14.51 | 15.07 | 15.62 | 16.18 | 4 | |
| 5 | 10.04 | 10.45 | 10.85 | 11.25 | 11.65 | 12.06 | | 10.72 | 11.16 | 11.61 | 12.06 | 12.50 | 12.95 | 5 | |
| 6 | 8.37 | 8.71 | 9.05 | 9.38 | 9.71 | 10.05 | | 8.93 | 9.30 | 9.67 | 10.05 | 10.42 | 10.79 | 6 | |
| 7 | 7.17 | 7.46 | 7.75 | 8.04 | 8.33 | 8.61 | | 7.66 | 7.97 | 8.29 | 8.61 | 8.93 | 9.25 | 7 | |
| 8 | 6.28 | 6.53 | 6.78 | 7.04 | 7.28 | 7.54 | | 6.70 | 6.98 | 7.26 | 7.54 | 7.82 | 8.09 | 8 | |
| 9 | 5.58 | 5.81 | 6.03 | 6.25 | 6.48 | 6.70 | | 5.95 | 6.20 | 6.45 | 6.70 | 6.95 | 7.20 | 9 | |
| 10 | 5.02 | 5.23 | 5.43 | 5.63 | 5.83 | 6.03 | | 5.36 | 5.58 | 5.81 | 6.03 | 6.25 | 6.48 | 10 | |
| 11 | 4.56 | 4.75 | 4.93 | 5.12 | 5.30 | 5.48 | | 4.87 | 5.08 | 5.28 | 5.48 | 5.64 | 5.89 | 11 | |
| 12 | 4.18 | 4.36 | 4.52 | 4.69 | 4.86 | 5.02 | | 4.46 | 4.65 | 4.84 | 5.02 | 5.21 | 5.40 | 12 | |
| 13 | 3.86 | 4.02 | 4.17 | 4.33 | 4.48 | 4.64 | | 4.12 | 4.29 | 4.47 | 4.64 | 4.81 | 4.98 | 13 | |
| 14 | 3.58 | 3.73 | 3.88 | 4.02 | 4.16 | 4.30 | | 3.82 | 3.99 | 4.15 | 4.31 | 4.47 | 4.63 | 14 | |
| 15 | 3.34 | 3.48 | 3.62 | 3.75 | 3.89 | 4.02 | | 3.57 | 3.72 | 3.87 | 4.02 | 4.17 | 4.32 | 15 | |
| 16 | 3.14 | 3.27 | 3.39 | 3.52 | 3.64 | 3.77 | | 3.35 | 3.49 | 3.63 | 3.77 | 3.91 | 4.05 | 16 | |
| 17 | 2.95 | 3.08 | 3.20 | 3.31 | 3.43 | 3.55 | | 3.15 | 3.29 | 3.42 | 3.55 | 3.68 | 3.81 | 17 | |
| 18 | 2.79 | 2.90 | 3.02 | 3.13 | 3.24 | 3.35 | | 2.98 | 3.10 | 3.23 | 3.35 | 3.47 | 3.59 | 18 | |
| 19 | 2.65 | 2.75 | 2.85 | 2.96 | 3.07 | 3.17 | | 2.82 | 2.99 | 3.06 | 3.17 | 3.29 | 3.41 | 19 | |
| 20 | 2.51 | 2.61 | 2.70 | 2.82 | 2.92 | 3.02 | | 2.68 | 2.79 | 2.90 | 3.02 | 3.13 | 3.24 | 20 | |
| 21 | 2.40 | 2.49 | 2.58 | 2.68 | 2.78 | 2.87 | | 2.55 | 2.66 | 2.77 | 2.87 | 2.98 | 3.08 | 21 | |
| 22 | 2.28 | 2.38 | 2.47 | 2.56 | 2.65 | 2.74 | | 2.44 | 2.54 | 2.64 | 2.74 | 2.84 | 2.95 | 22 | |
| 23 | 2.19 | 2.27 | 2.36 | 2.45 | 2.54 | 2.62 | | 2.33 | 2.43 | 2.53 | 2.62 | 2.72 | 2.82 | 23 | |
| 24 | 2.10 | 2.18 | 2.26 | 2.35 | 2.43 | 2.51 | | 2.24 | 2.33 | 2.43 | 2.51 | 2.61 | 2.69 | 24 | |
| 25 | 2.01 | 2.09 | 2.17 | 2.25 | 2.33 | 2.41 | | 2.15 | 2.23 | 2.32 | 2.41 | 2.50 | 2.59 | 25 | |
| 26 | 1.93 | 2.01 | 2.09 | 2.17 | 2.24 | 2.32 | | 2.06 | 2.15 | 2.23 | 2.32 | 2.41 | 2.49 | 26 | |
| 27 | 1.86 | 1.94 | 2.01 | 2.09 | 2.16 | 2.23 | | 1.99 | 2.07 | 2.15 | 2.23 | 2.32 | 2.40 | 27 | |
| 28 | 1.80 | 1.87 | 1.94 | 2.01 | 2.08 | 2.15 | | 1.92 | 2.00 | 2.08 | 2.15 | 2.23 | 2.31 | 28 | |
| 29 | 1.73 | 1.80 | 1.87 | 1.94 | 2.01 | 2.08 | | 1.85 | 1.93 | 2.00 | 2.08 | 2.16 | 2.23 | 29 | |
| 30 | 1.68 | 1.74 | 1.81 | 1.88 | 1.94 | 2.01 | | 1.79 | 1.86 | 1.94 | 2.01 | 2.09 | 2.16 | 30 | |

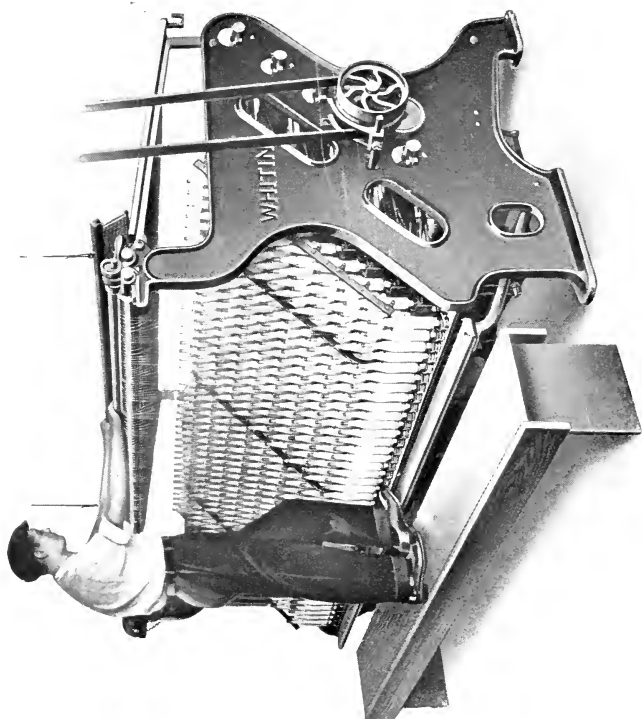
Note—Results in pounds per spindle per day of ten hours. Allowance is made in above table for doffing, etc.

Reel Production Tables. Continued.

| 72 IN. REEL. Revolutions per Minute. | | | | | 90 IN. REEL. Revolutions per Minute. | | | | | No. Yarn. | | | | |
|--------------------------------------|-------|-------|-------|-------|--------------------------------------|-------|-------|-------|-------|-----------|-------|-------|-------|-------|
| No. Yarn. | 110 | 115 | 120 | 125 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 |
| 1 | 58.93 | 61.61 | 64.29 | 66.97 | 69.65 | 72.33 | 75.01 | 77.69 | 80.36 | 83.04 | 85.71 | 88.39 | 91.06 | 93.74 |
| 2 | 29.47 | 30.81 | 32.15 | 33.49 | 34.83 | 36.16 | 37.50 | 38.84 | 40.18 | 41.52 | 42.86 | 44.19 | 45.53 | 46.87 |
| 3 | 19.65 | 20.54 | 21.43 | 22.33 | 23.22 | 24.11 | 25.00 | 25.89 | 26.78 | 27.67 | 28.56 | 29.45 | 30.34 | 31.23 |
| 4 | 14.74 | 15.40 | 16.07 | 16.74 | 17.41 | 18.08 | 18.75 | 19.42 | 20.09 | 20.76 | 21.43 | 22.10 | 22.77 | 23.44 |
| 5 | 11.79 | 12.32 | 12.86 | 13.40 | 13.93 | 14.47 | 15.00 | 15.54 | 16.07 | 16.60 | 17.13 | 17.66 | 18.19 | 18.72 |
| 6 | 9.82 | 10.27 | 10.72 | 11.16 | 11.61 | 12.05 | 12.50 | 12.94 | 13.38 | 13.83 | 14.27 | 14.71 | 15.15 | 15.59 |
| 7 | 8.42 | 8.73 | 9.03 | 9.37 | 9.70 | 10.03 | 10.36 | 10.69 | 11.02 | 11.35 | 11.68 | 12.01 | 12.34 | 12.67 |
| 8 | 7.37 | 7.70 | 8.04 | 8.37 | 8.71 | 9.04 | 9.37 | 9.70 | 10.03 | 10.36 | 10.69 | 11.02 | 11.35 | 11.68 |
| 9 | 6.55 | 6.85 | 7.15 | 7.44 | 7.74 | 8.04 | 8.37 | 8.71 | 9.04 | 9.37 | 9.70 | 10.03 | 10.36 | 10.69 |
| 10 | 5.90 | 6.16 | 6.43 | 6.70 | 6.97 | 7.23 | 7.50 | 7.77 | 8.04 | 8.31 | 8.58 | 8.85 | 9.12 | 9.39 |
| 11 | 5.36 | 5.60 | 5.85 | 6.09 | 6.33 | 6.58 | 6.83 | 7.07 | 7.31 | 7.56 | 7.80 | 8.04 | 8.28 | 8.52 |
| 12 | 4.91 | 5.14 | 5.36 | 5.58 | 5.81 | 6.03 | 6.26 | 6.48 | 6.70 | 6.92 | 7.14 | 7.36 | 7.58 | 7.80 |
| 13 | 4.54 | 4.74 | 4.95 | 5.15 | 5.36 | 5.57 | 5.77 | 5.98 | 6.18 | 6.38 | 6.58 | 6.78 | 6.98 | 7.18 |
| 14 | 4.21 | 4.40 | 4.59 | 4.79 | 4.97 | 5.17 | 5.37 | 5.57 | 5.74 | 5.94 | 6.14 | 6.34 | 6.54 | 6.74 |
| 15 | 3.93 | 4.11 | 4.29 | 4.47 | 4.64 | 4.82 | 4.99 | 5.17 | 5.36 | 5.54 | 5.72 | 5.91 | 6.09 | 6.28 |
| 16 | 3.69 | 3.85 | 4.02 | 4.19 | 4.36 | 4.52 | 4.69 | 4.86 | 5.02 | 5.19 | 5.36 | 5.53 | 5.70 | 5.87 |
| 17 | 3.47 | 3.63 | 3.78 | 3.94 | 4.09 | 4.26 | 4.41 | 4.58 | 4.73 | 4.89 | 5.05 | 5.21 | 5.37 | 5.53 |
| 18 | 3.28 | 3.43 | 3.57 | 3.72 | 3.87 | 4.02 | 4.17 | 4.32 | 4.47 | 4.62 | 4.77 | 4.92 | 5.07 | 5.22 |
| 19 | 3.10 | 3.24 | 3.39 | 3.53 | 3.67 | 3.81 | 3.96 | 4.10 | 4.25 | 4.39 | 4.54 | 4.69 | 4.83 | 4.98 |
| 20 | 2.95 | 3.08 | 3.22 | 3.35 | 3.49 | 3.62 | 3.76 | 3.90 | 4.04 | 4.18 | 4.32 | 4.46 | 4.60 | 4.74 |
| 21 | 2.81 | 2.94 | 3.06 | 3.19 | 3.32 | 3.45 | 3.58 | 3.71 | 3.84 | 3.97 | 4.10 | 4.23 | 4.36 | 4.49 |
| 22 | 2.68 | 2.80 | 2.92 | 3.05 | 3.17 | 3.29 | 3.42 | 3.54 | 3.67 | 3.79 | 3.92 | 4.04 | 4.17 | 4.29 |
| 23 | 2.56 | 2.68 | 2.80 | 2.91 | 3.03 | 3.15 | 3.27 | 3.39 | 3.51 | 3.63 | 3.75 | 3.87 | 3.99 | 4.11 |
| 24 | 2.46 | 2.57 | 2.68 | 2.79 | 2.90 | 3.02 | 3.13 | 3.24 | 3.35 | 3.46 | 3.57 | 3.68 | 3.79 | 3.90 |
| 25 | 2.36 | 2.47 | 2.57 | 2.68 | 2.79 | 2.90 | 3.01 | 3.12 | 3.23 | 3.34 | 3.45 | 3.56 | 3.67 | 3.78 |
| 26 | 2.27 | 2.37 | 2.47 | 2.58 | 2.68 | 2.78 | 2.88 | 2.99 | 3.09 | 3.19 | 3.29 | 3.39 | 3.49 | 3.59 |
| 27 | 2.19 | 2.28 | 2.38 | 2.48 | 2.58 | 2.68 | 2.78 | 2.88 | 2.98 | 3.08 | 3.18 | 3.28 | 3.38 | 3.48 |
| 28 | 2.11 | 2.20 | 2.30 | 2.39 | 2.49 | 2.58 | 2.68 | 2.78 | 2.88 | 2.98 | 3.08 | 3.18 | 3.28 | 3.38 |
| 29 | 2.03 | 2.13 | 2.22 | 2.31 | 2.40 | 2.50 | 2.59 | 2.69 | 2.79 | 2.89 | 2.99 | 3.09 | 3.19 | 3.29 |
| 30 | 1.97 | 2.06 | 2.15 | 2.23 | 2.32 | 2.41 | 2.50 | 2.59 | 2.68 | 2.77 | 2.86 | 2.95 | 3.04 | 3.13 |

Note:—Results in pounds per spindle per day of ten hours. Allowance is made in above table for doffing, etc.

QUILLING



Quilling Machine

THE WHITIN LONG-CHAIN QUILLING MACHINE

This machine has merited recognition as an important factor in the field of textile manufacturing. Through years of development and service, it has demonstrated its merit and adaptability to classes of work for which the ordinary skein process of quilling cannot be advantageously employed. It has further proven its efficiency and economy in quilling satisfactorily, all sizes of colored, bleached and mercerized yarns, also single or double yarns for braiders.

The machine is manufactured with the best of tools and equipment, by skilled workmen and under efficient management. The excellence of its design is therefore supplemented by the highest grade of workmanship while all materials used in its construction are carefully selected and of the best quality.

Since the introduction of our **Quilling Machine** to the textile industry, the long-chain process of finishing yarns has come into almost universal use in velvet, plush, bleached, colored and mercerized yarn mills. This process, in comparison with the methods still in use in some mills, of winding from a short-skein, has a number of essential points in its favor, among which may be mentioned:

First: The labor expense of preparing the yarn for bleaching, dyeing or mercerizing is greatly reduced.

Second: The yarn dyed in a long-chain takes a more even shade, showing more lustre and bloom than in the skein process.

Third: The yarn is wound direct from the chain onto bobbin or quill, ready for braiding or weaving without any intermediate process.

Fourth: The avoidance of burnt or burnished yarn, whereby the strength as well as the original brightness and clearness of the yarn is fully maintained.

Fifth: There is practically no waste in winding, and substantial savings are made in the cost of production, floor space occupied, and power consumed.

Sixth: The trouble due to "double filling" on re-wound bobbins is to a great extent eliminated. Should a "double" occur on our machine, the quill or bobbin will build correspondingly larger diameter, rendering it impossible to place the bobbin in the shuttle. In the skein winder a "double" does not alter the appearance of the bobbin, and the weaver, not noticing the defect, places the bobbin in the shuttle, with the results of a "pick-out" in the cloth, and the consequent loss of the weaver's time and the impairment to the quality of the cloth being woven.

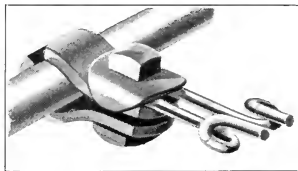


Common Spindle

Seventh: Lapped ends cannot be made, consequently bobbins wound on this machine will weave or unwind from start to finish without break of yarn, and also without leaving any waste on the bobbin.

The Whitin Quilling Machine is a rigidly constructed frame, consisting of two end standards connected together by bolster rails and tie rods, supported by one or more intermediate sampsons. The bolster or spindle rails are arranged in either 5, 6 or 9 tiers, each tier being fitted with from 25 to 42 spindles, according to model of frame. **The Spindles**, which are

driven by bands from cylinders in back of frame, may be either our common positively driven type, with bobbin friction drive, or, if preferred, the Holt and Seeley **patented spindle**. The former is best adapted for the coarser counts of yarn, whose strength would not be materially affected by the increasing tension due to the increasing weight of yarn in winding from empty to full bobbin. With this type of spindle the bobbin is supported on a loose collar which is frictionally driven from

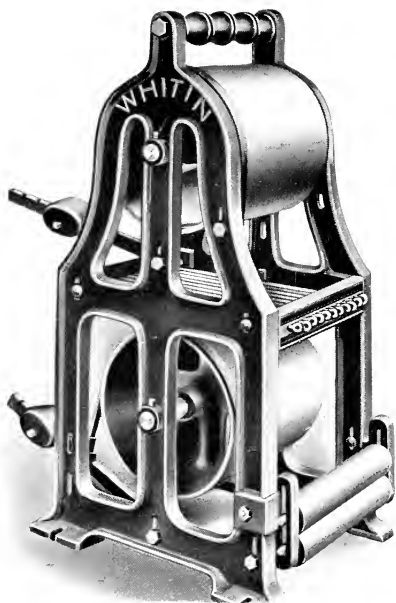


Yarn Guide



HOLT SPINDLE

the spindle by means of a friction washer of flannel or felt interposed between the collar and top of spindle whirl. The amount of tension imparted depends on the weights and sizes of washer and collar, and also the weight of the yarn on bobbin. Owing to the peculiar construction of the **Holt**



Friction Drums

spindle, the tension of the yarn is not affected by the weight of yarn on bobbin, for the reason that the bobbin is supported by the spindle, which is frictionally driven through a tension collar and a felt or flannel washer by a whirl loosely mounted on the bolster casing. By this construction a constant, predetermined tension is imparted to the yarn, irrespective of the weight of the bobbin, thus rendering this spindle particularly adapted for winding fine, delicate yarns. The spindles are made to order to fit bobbins suitable for the work required.

In front of each tier of spindles is a guide wire rod holding guide wires of hardened steel for each spindle. The rods are supported by inclined bars fastened to the lifting rods of the **builder motion**, which controls the length of traverse and style of wind on the bobbins. This motion is so designed that bobbins may be made for filling wind, warp wind, long straight wind, long wind with taper top, or long wind reversed. The motion has a quick return, which securely binds the yarn on the bobbin, thereby forming a very solid and compact bobbin, suitable for subsequent processes.

The shipping motion is operated by the foot of the operative, leaving both hands free for vibrating the reed to separate stuck ends as they come along in the chain of yarn.

The machine has no complicated mechanisms, one operative easily tending a machine of 378 spindles.

In operation, the **chain of yarn** to be quilled is drawn from a turntable over friction bars to friction drums, stationed about thirty feet from the frame, which allows sufficient spread to the yarn, and also gives the operative an opportunity to readily detect a lease or broken end as it is being drawn up, when the machine may be stopped to remedy the defect. The yarn passes through the suspended reed, to which the operative occasionally gives a backward and forward motion for the purpose of separating the ends that may be stuck together, thus preventing breakage of the yarn. From the reed the yarn is drawn under a cloth-covered friction roll, which also serves to catch loose ends. Thence the yarn passes to the guide wires, and is wound upon the bobbins.

Previous to doffing the bobbins the yarn is depressed by the operative by means of our patented **doffing mechanism** to a position below the upper flange of the bobbin collars, and then a few coils of yarn are wound thereon, for the purpose of holding the ends preparatory to starting a new set of bobbins. From time to time the waste yarn collecting on this collar can be readily removed by cutting with a knife along the groove in collar provided for this purpose.

The pulleys are 10 inches in diameter by 2 inches face; speed, 300 to 380 revolutions per minute.

Horse Power: 378 spindles, $2\frac{1}{2}$ inch space machine, consumes 2 horse power at 350 revolutions per minute of driving pulley.

Weights: (Model F Machine)

Domestic:

Net. 3375 pounds,
Gross, 3815 pounds,

Export:

Gross, 4350 pounds,
Cubic Feet, 150.

To suit the varied requirements of the trade in the matter of sizes and styles of bobbins to be quilled, our machines are made in **five standard models**, as follows:

| Model | Space | Size of Bobbin | | Number of Spindles | Length Overall |
|-------|--------|----------------|----------|--------------------|----------------|
| | | Diam. | Traverse | | |
| A | 2½ in. | 1¾ in. | 9 in. | 378 | 10 ft., 10 in. |
| F | 3 in. | 2 in. | 10 in. | 378 | 12 ft., 10 in. |
| M | 3½ in. | 2 in. | 10 in. | 378 | 13 ft., 6 in. |
| L | 4½ in. | 3 in. | 6 in. | 304 | 16 ft., 4½ in. |
| P | 5 in. | 4 in. | 6 in. | 168 | 11 ft., 5 in. |

For width, see floor plan on page 286.

In regard to the **production table**, given herewith, we have been governed entirely by the results reported by the various mills using these machines. We have found more or less divergence in the results obtained, owing to the particular conditions and processes under which each mill works up its product. However, for purposes of comparison, we have averaged all the results together for the reason that in the same mill we have found little difference in production on the same actual number, whether the yarn was in the gray, mercerized, colored, bleached or in ply.

In the last column, we have given a proportionate list of productions which would seem fair under the best conditions. We would caution mills, however, in making comparison with these estimated figures, as a number of conditions arise which would limit their production, among which we might mention:—

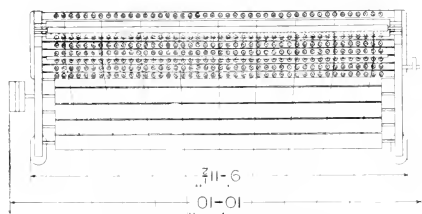
1. Expertness of help.
2. The condition, length and strength of the warps as delivered to the Quilling Machine.
3. If dyed, the color of the warp.
4. The size and traverse of the quill.

In brief, this table is only approximate, but, as such, we believe has value, if taken and considered in reference to the particular conditions of each mill.

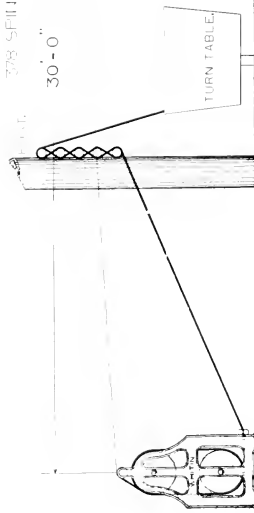
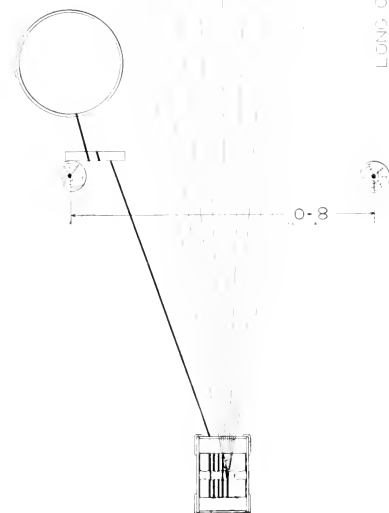
PRODUCTION TABLE

NUMBER OF POUNDS QUILLING PER DAY OF TEN HOURS
378 SPINDLE MACHINE.

| Number of yarn | Highest lbs. | Lowest lbs. | Averages obtained lbs. | A Fair Average lbs. |
|-------------------|-----------------|----------------|------------------------------|------------------------|
| 5's | 370 | 275 | 305 | 400 |
| 6's | 400 | 400 | 400 | 400 |
| 7's | 300 | 300 | 300 | 400 |
| 8's | 450 | 300 | 375 | 400 |
| 9's | 391 | 391 | 394 | 400 |
| 10's | 550 | 225 | 398 | 400 |
| 11's | 409 | 344 | 377 | 375 |
| 12's | 410 | 273 | 317 | 350 |
| 13's | 333 | 180 | 260 | 325 |
| 14's | 400 | 225 | 300 | 300 |
| 15's | 425 | 170 | 286 | 280 |
| 16's | 360 | 165 | 263 | 270 |
| 17's | 260 | 246 | 253 | 260 |
| 18's | 300 | 225 | 255 | 255 |
| 20's | 330 | 110 | 236 | 250 |
| 22's | 230 | 210 | 220 | 230 |
| 24's | 200 | 125 | 163 | 210 |
| 25's | 280 | 216 | 249 | 200 |
| 26's | 190 | 138 | 169 | 190 |
| 27's | 140 | 140 | 140 | 180 |
| 28's | 120 | 112 | 116 | 170 |
| 30's | 240 | 110 | 158 | 155 |
| 32's | 150 | 150 | 150 | 150 |
| 33's | 155 | 155 | 155 | 145 |
| 35's | 180 | 118 | 149 | 140 |
| 36's | 140 | 115 | 126 | 135 |
| 38's | 130 | 120 | 125 | 125 |
| 40's | 120 | 112 | 116 | 115 |
| 45's | 110 | 100 | 105 | 105 |
| 50's | 100 | 76 | 88 | 90 |
| 60's | 80 | 80 | 80 | 80 |
| 65's | 75 | 70 | 72 | 75 |
| 70's | 70 | 50 | 60 | 60 |
| 80's | 60 | 40 | 50 | 50 |



PLAN
OF
LONG CHAIR QUILLER
AND
CONNECTIONS,
378 SPIRALS, 24 SPACE.



ELEVATION.



CARE OF QUILLING MACHINES

In order to obtain the best results, both in the quality and quantity of quilled work, it is absolutely necessary that all parts of the machine be kept as clean as possible. The cleaning of the machines should be carefully attended to, especially in removing lint and oil that collects around the parts with which the yarn comes in contact. Waste must be kept away from the spindle and friction washer, as a soft quill would be formed if a small piece of waste should catch under the spindle cap.

At regular intervals the old oil should be pumped out of the spindle bolsters and refilled with a good light oil. Care should be taken not to get too much oil in the bolsters, or the yarn will be stained by the oil thrown by the spindle.

Bands should be made of good strong roving, about 100 to the pound, and not put on too tightly.

Guide wires should be carefully examined and renewed when badly worn.

Badly fitted quills or bobbins are the cause of considerable trouble, therefore the greatest care should be exercised in their selection. Whenever an end breaks and runs in double, the operator should pull it back, for if this is not done, faulty work will result.

In piecing up, the operator should be careful to hold the ends tightly until all slack is taken up, otherwise the yarn is wound on slack and will slub off in the loom, resulting in poor cloth.

Repairs.

We have issued for the convenience of users of our machinery, **Illustrated Circulars of the Component Parts** of each machine which we build. The various pieces are illustrated in a clear manner, numbered and named, so that if the directions for ordering repairs, as stated in circulars, are followed there will be no doubt but what the orders will be correctly filled, with the least possible delay. Copies of these circulars have been sent to all our customers, and extra copies will be sent on application.

The Hands of Machines.

To determine the **Hands** of our **Machines**, face the delivery and note which hand side the driving pulleys are.

Shipping Directions.

We prefer our customers to furnish directions for shipping their orders, but if not given and the package is small, we send by express, if large by freight, selecting the most reliable routes and the lowest freight rates that can be secured.

MISCELLANEOUS

RULES FOR CALCULATING THE SPEED OF GEARS OR PULLEYS.

In calculating for gears, multiply or divide by the diameter or the number of teeth, as may be required. In calculating for pulleys, multiply or divide by their diameters in inches.

The driving wheel is called the *driver*, and the driven wheel the *driven* or *follower*.

Problem I.

The revolutions of driver and driven, and the diameter of the driven, being given, required the diameter of the driver.

Rule.—Multiply the diameter of the driven by its number of revolutions, and divide by the number of revolutions of the driver.

Problem II.

The diameter and revolutions of the driver being given, required the diameter of the driven to make a given number of revolutions in the same time.

Rule.—Multiply the diameter of the driver by its number of revolutions, and divide the product by the required number of revolutions.

Problem III.

The diameter or number of teeth, and number of revolutions of the driver, with the diameter or number of teeth of the driven, being given, required the revolutions of the driven.

Rule.—Multiply the diameter or number of teeth of the driver by its number of revolutions, and divide by the diameter or number of teeth of the driven.

Problem IV.

The diameter of driver and driven, and the number of revolutions of the driven, being given, required the number of revolutions of the driver.

Rule.—Multiply the diameter of the driven by its number of revolutions, and divide by the diameter of the driver.

To find the width of belt and diameter of shaft to transmit a stated horse power at a given speed, the following Harpers' short formulae are convenient:

Leather Belts.

Single belting — 1"-2"-3"-4"-5"-6"-7"-8"-9"-10"-12"-15"-18" wide will transmit $\frac{1}{8}$ - $\frac{1}{4}$ - $\frac{3}{8}$ - $\frac{1}{2}$ - $\frac{5}{8}$ - $\frac{3}{4}$ - $\frac{7}{8}$ - 1 - $1\frac{1}{8}$ - $1\frac{1}{4}$ - $1\frac{1}{2}$ - $1\frac{7}{8}$ - $2\frac{1}{4}$ H. P. for every 100 feet of velocity per minute. Double belts transmit $1\frac{1}{2}$ times as much as single belts.

Rope Driving.

One rope — $\frac{3}{4}$ " - 1" - $1\frac{1}{4}$ " - $1\frac{1}{2}$ " - $1\frac{3}{4}$ " - 2" diameter will transmit $\frac{1}{8}$ - $\frac{1}{4}$ - $\frac{3}{8}$ - $\frac{1}{2}$ - $\frac{5}{8}$ - 1 horse power for every 100 feet of velocity per minute.

Shafting.

Steel Shafting — $1\frac{1}{2}$ " - 2" - $2\frac{1}{2}$ " - 3" - $3\frac{1}{2}$ " - 4" - $4\frac{1}{2}$ " - 5" - $5\frac{1}{2}$ " - 6" diameter will transmit $\frac{1}{2}$ - $1\frac{1}{8}$ - $2\frac{1}{4}$ - $3\frac{7}{8}$ - 6 - 9 - 13 - 18 - 24 - 31 horse power for every ten revolutions per minute.

To ascertain any length of belt required:

Take twice the distance from centre to centre of shafting and add half the circumference of each pulley.

To determine the length of belt when changing the size of one of the pulleys:

Take the difference between the diameters of the two pulleys, and one-half the difference, and add to length if the change is to a larger pulley, and subtract from length if the change is to a smaller pulley.

To determine the length of cross belts:

Square the diameter of the large pulley and the distance between centers; add together and extract the square root.

Square the diameter of the small pulley and the distance between centers; add together and extract the square root.

To the sum of the two roots add one-half the circumference of the two pulleys, and the total will be the required length.

NOTES ON BELTING

In the location of shafts that are to be connected with each other by belts, care should be taken to have a proper distance between them. This distance should be such as to allow of a gentle sag to the belt when in motion.

A general rule for this distance is as follows: 15 feet is a good average where narrow belts are to run over small pulleys, the belt having a sag of $1\frac{1}{2}$ to 2 inches.

For larger belts working on larger pulleys, a distance of 20 to 25 feet is proper.

For main belts working on very large pulleys, the distance should be 25 to 30 feet, the belts working well with a sag of 4 or 5 inches.

If too great a distance is attempted, the weight of the belt will produce a very heavy sag, drawing so hard on the shaft as to produce great friction in the bearings, while at the same time the belt will have an unsteady flapping motion which will in a short time destroy both belt and machinery.

Connected shafts should never be placed one directly over the other if possible to avoid it, as in such case the belt must be kept very tight to do the work.

The diameter of pulleys should be as large as possible, provided they do not produce a belt speed exceeding 3000 feet per minute.

Never add to the work of a belt so much as to overload it.

Single belts should be put on so as to run with the grain, or hair side, next to the pulleys, and so the points of the laps will run against the pulleys, as the laps on the outside of a belt are most liable to come apart when the points are run against the atmospheric pressure.

Double belts should be put on so that the points of the laps will run with the pulleys, as both sides point in the same direction.

Belts should be kept clean and free from accumulations of dust and grease, and particularly from contact with lubricating oils, some of which permanently injure leather.

Leather belts must be well protected against water, and even moisture.

Belts should be kept soft and pliable.

EQUIVALENTS OF YARN COUNTS

| 120 Yds. Weigh Grains | Woolen Runs | Woolen Cuts | Worsted Number | Linen Leas | Cotton Counts | 120 Yds. Weigh Grains | Woolen Runs | Woolen Cuts | Worsted Number | Linen Leas | Cotton Counts |
|-----------------------------|----------------|-----------------|-------------------|---------------|------------------|-----------------------------|-----------------|-----------------|-------------------|---------------|------------------|
| 2100 | $1\frac{1}{4}$ | $1\frac{1}{3}$ | 71 | 1.33 | .48 | 87.48 | 6 | 32 | 17.14 | 32 | 11.43 |
| 1050 | $1\frac{1}{2}$ | $2\frac{2}{3}$ | 1.43 | 2.67 | .95 | 84. | $6\frac{1}{4}$ | $33\frac{1}{3}$ | 17.85 | 33.33 | 11.90 |
| 699.96 | $3\frac{3}{4}$ | 4 | 2.14 | 4 | 1.43 | 80.76 | $6\frac{1}{2}$ | $34\frac{2}{3}$ | 18.57 | 34.67 | 12.38 |
| 525. | 1 | $5\frac{1}{3}$ | 2.86 | 5.33 | 1.90 | 77.76 | $6\frac{3}{4}$ | 36 | 19.28 | 36. | 12.86 |
| 420. | $1\frac{1}{4}$ | $6\frac{2}{3}$ | 3.57 | 6.67 | 2.39 | 75. | 7 | $37\frac{1}{3}$ | 20. | 37.33 | 13.33 |
| 349.99 | $1\frac{1}{2}$ | 8 | 4.28 | 8. | 2.86 | 72.41 | $7\frac{1}{4}$ | $38\frac{2}{3}$ | 20.71 | 38.67 | 13.81 |
| 300. | $1\frac{3}{4}$ | $9\frac{1}{3}$ | 5. | 9.33 | 3.33 | 69.98 | $7\frac{1}{2}$ | 40 | 21.43 | 40. | 14.29 |
| 262.49 | 2 | $10\frac{2}{3}$ | 5.71 | 10.67 | 3.81 | 67.73 | $7\frac{3}{4}$ | $41\frac{1}{3}$ | 22.14 | 41.33 | 14.76 |
| 232.23 | $2\frac{1}{4}$ | 12 | 6.43 | 12. | 4.29 | 65.62 | 8 | $42\frac{2}{3}$ | 22.85 | 42.67 | 15.24 |
| 210 | $2\frac{1}{2}$ | $13\frac{1}{3}$ | 7.14 | 13.33 | 4.76 | 63.62 | $8\frac{1}{4}$ | 44 | 23.57 | 44. | 15.71 |
| 190.85 | $2\frac{3}{4}$ | $14\frac{2}{3}$ | 7.85 | 14.67 | 5.24 | 61.75 | $8\frac{1}{2}$ | $45\frac{1}{3}$ | 24.28 | 45.33 | 16.19 |
| 174.98 | 3 | 16 | 8.57 | 16. | 5.71 | 60. | $8\frac{3}{4}$ | $46\frac{2}{3}$ | 25. | 46.67 | 16.67 |
| 161.52 | $3\frac{1}{4}$ | $17\frac{1}{3}$ | 9.28 | 17.33 | 6.17 | 58.32 | 9 | 48 | 25.71 | 48. | 17.24 |
| 150. | $3\frac{1}{2}$ | $18\frac{2}{3}$ | 10. | 18.67 | 6.67 | 56.76 | $9\frac{1}{4}$ | $49\frac{1}{3}$ | 26.43 | 49.33 | 17.62 |
| 139.99 | $3\frac{3}{4}$ | 20 | 10.71 | 20. | 7.14 | 55.25 | $9\frac{1}{2}$ | $50\frac{2}{3}$ | 27.14 | 50.67 | 18.96 |
| 131.26 | 4 | $21\frac{1}{3}$ | 11.43 | 21.33 | 7.62 | 53.83 | $9\frac{3}{4}$ | 52 | 27.85 | 52. | 18.57 |
| 123.53 | $4\frac{1}{4}$ | $22\frac{2}{3}$ | 12.14 | 22.67 | 8.10 | 52.49 | 10 | $53\frac{1}{3}$ | 28.57 | 53.33 | 19.48 |
| 116.67 | $4\frac{1}{2}$ | 24 | 12.85 | 24. | 8.57 | 51.22 | $10\frac{1}{4}$ | $54\frac{2}{3}$ | 29.28 | 54.67 | 19.52 |
| 110.52 | $4\frac{3}{4}$ | $25\frac{1}{3}$ | 13.57 | 25.33 | 9.05 | | | | | | |
| 105. | 5 | $26\frac{2}{3}$ | 14.28 | 26.67 | 9.52 | | | | | | |
| 99.98 | $5\frac{1}{4}$ | 28 | 15. | 28. | 10. | | | | | | |
| 95.45 | $5\frac{1}{2}$ | $29\frac{1}{3}$ | 15.71 | 29.33 | 10.47 | | | | | | |
| 91.30 | $5\frac{3}{4}$ | $30\frac{2}{3}$ | 16.43 | 30.67 | 10.95 | | | | | | |

APPROXIMATE POWER CONSUMED BY COTTON MACHINERY

The Power Required to drive Cotton Machinery varies according to the speed and production of the machines. The following may be taken as a fair average:

| | | | | | |
|--|-----------------|---|---|----------------------------------|-------|
| Willow | | | | 7 | H. P. |
| Bale Breaker | | | | 5 | " |
| Single Beater Picker | | | | 4 | " |
| Double Beater Picker | | | | 8 | " |
| Self-Feeder | | | | 1 $\frac{1}{2}$ | " |
| Roller Card | | | | 2 to 3 | " |
| Revolving Flat Card | | | | $\frac{3}{4}$ to 1 $\frac{1}{2}$ | " |
| Sliver Lap Machine | | | | $\frac{1}{2}$ | " |
| Ribbon Lap Machine | | | | 1 | " |
| Comber, 8 Heads | | | | $\frac{1}{2}$ | " |
| Drawing Frame, per delivery | | | | $\frac{1}{4}$ | " |
| Slubber Fly Frame | 48 Spindles per | | | | " |
| Intermediate Fly Frame | 60 | " | " | | " |
| Fine Fly Frame | 90 | " | " | | " |
| Jack Fly Frame | 110 | " | " | | " |
| Spinning Frame, Medium No. 1 Gravity | | | | | |
| Spindle, 8,500 Revolutions | 55 | " | " | | " |
| Spinning Frame, Standard No. 1 Gravity | | | | | |
| Spindle, 9,700 Revolutions | 65 | " | " | | " |
| Spooler | 200 | " | " | | " |
| Mule Spindle, 9,600 Revolutions | 130 | " | " | | " |
| Quiller | 190 | " | " | | " |
| Twister Spindle, 6,500 Revolutions | 40 | " | " | | " |
| Warper | | | | $\frac{1}{15}$ to $\frac{1}{4}$ | " |
| Slasher | | | | 1 $\frac{1}{2}$ to 2 | " |
| Loom | | | | $\frac{1}{15}$ to $\frac{1}{3}$ | " |
| Wide Loom | | | | 1 | " |
| Yarn Reel, 50 Spindles | | | | $\frac{1}{10}$ | " |
| Brusher and Shearer | | | | 3 | " |
| Folder | | | | $\frac{1}{8}$ | " |
| Screw Press | | | | $\frac{1}{2}$ | " |
| Engine Lathe | | | | $\frac{1}{4}$ to $\frac{3}{4}$ | " |
| Upright Drill | | | | $\frac{1}{10}$ | " |

DECIMAL EQUIVALENTS OF FRACTIONS OF AN INCH.

| | | | | | | | |
|----------------|---------|-----------------|---------|-----------------|---------|-----------------|---------|
| $\frac{1}{32}$ | 0.03125 | $\frac{9}{32}$ | 0.28125 | $\frac{17}{32}$ | 0.53125 | $\frac{25}{32}$ | 0.78125 |
| $\frac{1}{16}$ | 0.0625 | $\frac{5}{16}$ | 0.3125 | $\frac{9}{16}$ | 0.5625 | $\frac{13}{16}$ | 0.8125 |
| $\frac{3}{32}$ | 0.09375 | $\frac{11}{32}$ | 0.34375 | $\frac{19}{32}$ | 0.59375 | $\frac{27}{32}$ | 0.84375 |
| $\frac{1}{8}$ | 0.125 | $\frac{3}{8}$ | 0.375 | $\frac{5}{8}$ | 0.625 | $\frac{7}{8}$ | 0.875 |
| $\frac{5}{32}$ | 0.15625 | $\frac{13}{32}$ | 0.40625 | $\frac{21}{32}$ | 0.65625 | $\frac{29}{32}$ | 0.90625 |
| $\frac{3}{16}$ | 0.1875 | $\frac{7}{16}$ | 0.4375 | $\frac{11}{16}$ | 0.6875 | $\frac{15}{16}$ | 0.9375 |
| $\frac{7}{32}$ | 0.21875 | $\frac{15}{32}$ | 0.46875 | $\frac{23}{32}$ | 0.71875 | $\frac{31}{32}$ | 0.96875 |
| $\frac{1}{4}$ | 0.25 | $\frac{1}{2}$ | 0.5 | $\frac{3}{4}$ | 0.75 | 1 | 1.0 |

CIRCUMFERENCES OF CIRCLES ADVANCING BY 8ths.

| Diameter | CIRCUMFERENCES | | | | | | | |
|----------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | 0 | $\frac{1}{8}$ | $\frac{1}{4}$ | $\frac{3}{8}$ | $\frac{1}{2}$ | $\frac{5}{8}$ | $\frac{3}{4}$ | $\frac{7}{8}$ |
| 0 | | 0.3927 | 0.7854 | 1.178 | 1.570 | 1.963 | 2.356 | 2.748 |
| 1 | 3.141 | 3.534 | 3.927 | 4.319 | 4.712 | 5.105 | 5.497 | 5.890 |
| 2 | 6.283 | 6.675 | 7.068 | 7.461 | 7.854 | 8.246 | 8.639 | 9.032 |
| 3 | 9.424 | 9.817 | 10.21 | 10.60 | 10.99 | 11.38 | 11.78 | 12.17 |
| 4 | 12.56 | 12.95 | 13.35 | 13.74 | 14.13 | 14.52 | 14.92 | 15.31 |
| 5 | 15.70 | 16.10 | 16.49 | 16.88 | 17.27 | 17.67 | 18.06 | 18.45 |
| 6 | 18.84 | 19.24 | 19.63 | 20.02 | 20.42 | 20.81 | 21.20 | 21.59 |
| 7 | 21.99 | 22.38 | 22.77 | 23.16 | 23.56 | 23.95 | 24.34 | 24.74 |
| 8 | 25.13 | 25.52 | 25.91 | 26.31 | 26.70 | 27.09 | 27.48 | 27.88 |
| 9 | 28.27 | 28.66 | 29.05 | 29.45 | 29.84 | 30.23 | 30.63 | 31.02 |
| 10 | 31.41 | 31.80 | 32.20 | 32.59 | 32.98 | 33.37 | 33.77 | 34.16 |

Diameter of a circle \times 3.1416 = the circumference

CONVENIENT MULTIPLIERS.

Circles, Areas and Figures.

Diameter of a circle $\times 3.1416$ or $\frac{22}{7}$ = the circumference.
Circumference of a circle $\times 0.31831$ or $\frac{7}{22}$ = the diameter.
Square of diameter $\times 0.7854$ = the area of the circle.
Square of diameter $\times \frac{11}{14}$ = the area of the circle.
Square root of area $\times 1.12837$ = the diameter of a circle.
Radius of circle $\times 6.28318$ = the circumference.
Circumference = $3.5449 \times \sqrt{\text{area of circle}}$.
Diameter of a circle $\times 0.8862$ = the side of an equal square.
Side of a square $\times 1.128$ = the diameter of an equal circle.
Area of a triangle = the base $\times \frac{1}{2}$ the perpendicular height.
Square of the diameter of a sphere $\times 3.1416$ = the convex surface.
Cube of the diameter of a sphere $\times 0.5236$ = the solidity.
Diameter of a sphere $\times 0.806$ = the edge of an equal cube.
Diameter of a sphere $\times 0.6667$ = the length of an equal cylinder.
Surface of a cylinder = area of both ends + length \times circumference.
Solidity of a cylinder = area of one end \times the length.
Solidity of a cone = area of the base $\times \frac{1}{3}$ the perpendicular height.
Area of an ellipse = long axis \times short axis $\times 0.7854$.

Conversion of one Denomination to another.

Feet $\times 0.00019$ = miles.
Yards $\times 0.0006$ = miles.
Square inches $\times 0.00694$ = square feet.
Square feet $\times 144$ = square inches.
Cubic feet $\times 0.037$ = cubic yards.
Cubic inches $\times 0.000579$ = cubic feet.
Cubic feet $\times 6.2355$ = gallons.
Gallons $\times 0.16059$ = cubic feet.
Gallons $\times 10$ = lbs. of distilled water.
Cubic feet of water $\times 62.425$ = lbs. avoirdupois.
Cubic inches of water $\times 0.03612$ = lbs. avoirdupois.
Lbs. avoirdupois $\times 1.2153$ = lbs. Troy or apothecary.
Lbs. Troy or apothecary $\times 0.8228$ = lbs. avoirdupois.
Lbs. avoirdupois $\times 0.00893$ = cwt.
Lbs. avoirdupois $\times 0.000447$ = tons.
Tons of water $\times 224$ = gallons.

HOW TO ASCERTAIN HORSEPOWER OF BOILERS.

Standard adopted by American Society of Mechanical Engineers is 30 pounds of water evaporated into dry steam per hour from temperature of feed water 100° Fahrenheit, into steam of 70 pounds pressure.

Compound engines will develop a horsepower on 15 pounds of water.

Single condensing engine will develop a horsepower on 18 to 22 pounds of water.

Automatic non-condensing engine will develop a horsepower on 28 to 32 pounds of water.

Slide-valve throttle-governing engine will develop a horsepower on one cubic foot, or 62½ pounds of water.

STEAM MEMORANDA.

A cubic inch of water evaporated under ordinary atmospheric pressure is converted into one cubic foot of steam (approximately).

The specific gravity of steam (at atmospheric pressure) is .411 that of air at 34° Fahrenheit, and .0006 that of water at same temperature.

27.222 cubic feet of steam weigh one pound; 13.817 cubic feet of air weigh one pound.

Locomotives average a consumption of 3,000 gallons of water per 100 miles run.

The best designed boilers, well set, with good draft, and skillful firing, will evaporate from 7 to 10 pounds of water per pound of first-class coal.

On one square foot of grate can be burned on an average from 10 to 12 pounds of hard coal, or 18 to 20 pounds of soft coal, per hour, with natural draft. With forced draft nearly double these amounts can be burned.

Steam engines, in economy, vary from 14 to 60 pounds of feed water, and from 1½ to 7 pounds of coal per hour per indicated horsepower.

Condensing engines require from 20 to 30 gallons of water, at an average low temperature, to condense the steam represented by every gallon of water evaporated in the boilers supplying the engines—approximately for most engines, we say, from 1 to 1½ gallons condensing water per minute, per indicated horsepower.

HORSEPOWER OF AN ENGINE.

a = Area of the piston in square inches.

p = Mean effective pressure of the steam on the piston per square inch.

v = Velocity of piston per minute.

$$\text{Then H. P.} = \frac{a \times p \times v}{33,000}$$

The mean pressure in the cylinder when cutting off at

| | | | |
|------------|---|-------------------------------|------|
| 1/4 stroke | = | boiler pressure multiplied by | .597 |
| 1/3 " | = | " " | .670 |
| 3/8 " | = | " " | .743 |
| 1/2 " | = | " " | .847 |
| 5/8 " | = | " " | .919 |
| 2/3 " | = | " " | .937 |
| 3/4 " | = | " " | .966 |
| 7/8 " | = | " " | .992 |

To find the diameter of a cylinder of an engine of a required nominal horsepower:

$$\frac{5500}{v} \text{—multiplied by H. P. = a.}$$

v

WATER MEMORANDA.

Doubling the diameter of a pipe increases its capacity four times. Friction of liquids in pipes increases as the square of the velocity.

To find the pressure in pounds per square inch of a column of water, multiply the height of the column in feet by .434. Approximately, we say that every foot elevation is equal to $\frac{1}{2}$ pound pressure per square inch; this allows for ordinary friction.

To find the diameter of a pump cylinder to remove a given quantity of water per minute (100 feet of piston being the standard of speed), divide the number of gallons by 4, then extract the square root, and the product will be the diameter in inches of the pump cylinder.

To find quantity of water elevated in one minute, running at 100 feet of piston speed per minute, square the diameter of the water cylinder in inches, and multiply by 4.

To find the horsepower necessary to elevate water to a given height, multiply the weight of the water elevated per minute in pounds by the height in feet, and divide the product by 33,000 (an allowance should be added for water friction, and a further allowance for loss in steam cylinder, say from 20 to 30 per cent).

The area of the steam piston, multiplied by the steam pressure, gives the total amount of pressure that can be exerted. The area of the water piston, multiplied by the pressure of water per square inch, gives the resistance. A margin must be made between the power and the resistance to move the pistons at the required speed, say from 20 to 40 per cent, according to speed and other conditions.

To find the capacity of a cylinder in gallons, multiply the area in inches by the length of stroke in inches, will give the total number of cubic inches; divide this amount by 231 (which is the cubical contents of a U. S. gallon in inches), and product is the capacity in gallons.

ELECTRICAL UNITS.

Volt—The unit of electrical motive force. Force required to send one ampere of current through one ohm of resistance.

Ohm—Unit of resistance. The resistance offered to the passage of one ampere when impelled by one volt.

Ampere—Unit of current. The current which one volt can send through a resistance of one ohm.

Watt—The unit of electrical energy, and is the product of ampere and volt. That is, one ampere of current flowing under a pressure of one volt gives one watt of energy.

One electrical horsepower is equal to 746 watts.

One Kilowatt is equal to 1,000 watts.

To find the watts consumed in a given electrical circuit, such as a lamp, multiply the volts by the amperes.

To find the volts, divide the watts by the amperes.

To find the amperes, divide the watts by the volts.

To find the electrical horsepower required by a lamp, divide the watts of the lamp by 746.

To find the number of lamps that can be supplied by one electrical horsepower of energy, divide 746 by the watts of the lamp.

To find the electrical horsepower necessary, multiply the watts per lamp by the number of lamps, and divide by 746.

To find the mechanical horsepower necessary to generate the required electrical horsepower, divide the latter by the efficiency of the generator.

To find the amperes of a given circuit, of which the volts and ohms resistance are known, divide the volts by the ohms.

To find the volts, when the amperes and watts are known, multiply the amperes by the ohms.

To find the resistance in ohms, when the volts and amperes are known, divide the volts by the amperes.

USEFUL DATA

1 Pint of water weighs a pound and a quarter.

1 Gallon of water = .1605 cubic feet = 10 lb. of water at 62° F.

1 Knot = 6080 feet = 1.15 statute miles.

1 Mile = 5280 feet.

1 Pound (Avoirdupois) = 7000 grains = 453.6 grammes.

1 Pound (Troy) = 5,760 grains.

1 horse power = 33,000 foot lbs. of work done per min. = 746 watts.

1 French horse power or force de cheval = 4500 kilogrammetres per min. = .9863 English horse power.

1 English horse power = 1.01385 French force de cheval.

The pressure of one atmosphere = 14.7 lbs. per square inch = 2116 lbs. per square foot = a column of mercury 760 m/m high.

A column of water 2.3 feet high corresponds to a pressure of 1 lb. per square inch.

Cubic inches of cast iron $\times 0.26$ = lbs. Avoirdupois.

Cubic inches of wrought iron $\times 0.28$ = lbs. Avoirdupois.

Thickness of wrought iron plate in inches $\times 40$ = lbs. per square foot.

Sectional area of wrought iron in inches $\times 3.34$ = lbs. per lineal foot.

Diameter of wrought iron in inches squared $\times 2.64$ = lbs. per lineal foot.

A freely falling body traverses a distance of 16.08 feet the first second.

The distance traversed in any number of seconds is equal to $16.08 \times$ number of seconds squared.

A horse power represents the ability to raise 33,000 pounds one foot high in one minute.

Water weighs about $62\frac{1}{2}$ pounds to cubic foot.

One acre equals 43560 square feet.

COMPARATIVE TABLE OF THE UNITED STATES AND METRIC SYSTEMS

| Denomination | Equivalent |
|--|------------|
| One grain equals in grammes | 0.0648 |
| One pound avoirdupois equals in kilogrammes | 0.4536 |
| One ton of 2240 pounds equals in tonnes | 1.0160 |
| One ton of 2000 pounds equals in tonnes | 0.9071 |
| One inch equals in millimetres | 25.400 |
| One foot equals in metres | 0.3048 |
| One mile equals in kilometres | 1.6094 |
| One square inch equals in square millimetres | 645.2 |
| One square foot equals in square metres | 0.09291 |
| One acre equals in ares (100 square metres) | 40.47 |
| One square mile equals in square kilometres | 2.590 |
| One cubic inch equals in cubic centimetres | 16.39 |
| One cubic foot equals in cubic metres | 0.02832 |
| One cubic yard equals in cubic metres | 0.7646 |
| One quart dry measure equals in litres | 1.101 |
| One quart liquid or wine measure equals in litres | 0.9465 |
| One foot pound equals in kilogrammetres | 0.1383 |
| One pound per foot equals in kilogrammes per metre | 1.488 |
| One thousand pounds per square inch equals in kilogrammes per square millimetres | 0.703 |
| One pound per square foot equals in kilogrammes per square metre | 4.882 |
| One pound per cubic foot equals in kilogrammes per cubic metre | 16.02 |
| One degree Fahrenheit equals in degrees Centigrade | 0.5556 |

COMPARATIVE TABLE OF THE METRIC AND UNITED STATES SYSTEMS

| | |
|---|---------|
| One gramme equals in grains | 15.433 |
| One kilogramme equals in pounds avoirdupois | 2.2047 |
| One tonne equals in tons of 2240 pounds | 0.9843 |
| One tonne equals in tons of 2000 pounds | 1.1024 |
| One millimetre equals in inches | 0.0394 |
| One metre equals in feet | 3.2807 |
| One kilometre equals in miles | 0.6213 |
| One square millimetre equals in square inches | 0.00155 |
| One square metre equals in square feet | 10.763 |
| One are (100 square metres) equals in acres | 0.02471 |
| One square kilometre equals in square miles | 0.3861 |
| One cubic centimetre equals in cubic inches | 0.0610 |
| One cubic metre or stere equals in cubic feet | 35.3105 |
| One cubic metre equals in cubic yards | 1.3078 |
| One litre (one cubic decimetre) equals in cubic inches | 61.017 |
| One litre equals in quarts, dry measure | 0.908 |
| One litre equals in quarts, liquid or wine measure | 1.0566 |
| One kilogrammetre equals in foot pounds | 7.2331 |
| One kilogramme per metre equals in pounds per foot | 0.6720 |
| One kilogramme per sq. millimetre equals in pounds per sq. inch | 1422. |
| One kilogramme per sq. metre equals in pounds per sq. foot | 0.2048 |
| One kilogramme per cubic metre equals in pounds per cubic foot | 0.0624 |
| One degree Centigrade equals in degrees Fahrenheit | 1.8 |

METRIC CONVERSION TABLE

| | |
|---|--|
| Millimetres $\times .03937$ = inches. | Hectolitres $\times .131$ = cu. yds. |
| Millimetres $\div 25.4$ = inches. | Hectolitres $\div 26.42$ = gals. (231 cu. in.) |
| Centimetres $\times .3937$ = inches. | Grammes $\times 15.432$ = grains |
| Centimetres $\div 2.54$ = inches. | Grammes $\div 981.$ = dynes. |
| Metres $\times 39.37$ = inches. | Grammes (water) $\div 29.57$ = fluid oz. |
| Metres $\times 3.281$ = feet. | Grammes $\div 28.35$ = oz. avoirdupois. |
| Metres $\times 1.094$ = yards. | Grammes per cu. cent. $\div 27.7$ = lbs. p. cu. in. |
| Kilometres $\times .621$ = miles. | Joule $\times .7373$ = ft. lbs. |
| Kilometres $\div 1.6093$ = miles. | Kilo-grammes $\times 2.2046$ = pounds. |
| Kilometres $\times 3280.8693$ = feet. | Kilo-grammes $\times 35.3$ = oz. avoirdupois. |
| Sq. Millimetres $\times .00155$ = sq. in. | Kilo-grammes $\div 907.2$ = tons (2000 lbs.) |
| Sq. Millimetres $\div 645.1$ = sq. in. | Kilo-gr. p. sq. cent. $\times 14.223$ = lbs. p. sq. in. |
| Sq. Centimetres $\times .155$ = sq. in. | Kilo-gram.-metres $\times 7.233$ = ft. lbs. |
| Sq. Centimetres $\div 6.451$ = sq. in. | Kilo-gr. p. Metre $\times .672$ = lbs. per ft. |
| Sq. Metres $\times 10.764$ = sq. ft. | Kilo-gr. p. cu. Metre $\times .062$ = lbs. p. cu. ft. |
| Sq. Kilometres $\times 247.1$ = acres. | Kilo-gr. p. Cheval $\times 2.235$ = lbs. p. H. P. |
| Hectare $\times 2.471$ = acres | Kilo-Watts $\times 1.34$ = Horsepower. |
| Cu. Centimetres $\div 16.383$ = cu. in. | Watts $\div 746.$ = Horsepower. |
| Cu. Centimetres $\div 3.69$ = fl. drams. | Watts $\times .7373$ = ft. pounds p. second. |
| Cu. Centimetres $\div 29.57$ = fluid oz. | Calorie $\times 3.968$ = B. T. U. |
| Cu. Metres $\times 35.315$ = cu. ft. | Cheval vapeur $\times .9863$ = Horsepower. |
| Cu. Metres $\times 1.308$ = cu. yards | (Centigrade $\times 1.8$) + 32 = degree Fahr. |
| Cu. Metres $\times 264.2$ = gals. (231 cu. in.) | Franc $\times .193$ = Dollars. |
| Litres $\times 61.022$ = cu. in. | Gravity Paris = 980.94, centimetres per sec. |
| Litres $\times 33.84$ = fluid oz. | |
| Litres $\times .2642$ = gals. (231 cu. in.) | |
| Litres $\div 3.78$ = gals. (231 cu. in.) | |
| Litres $\div 28.316$ = cu. ft. | |
| Hectolitres $\times 3.531$ = cu. ft. | |
| Hectolitres $\times 2.84$ = Bu. (2150.42 cu. in.) | |

HUMIDITY

In the manufacture of textile products, either of cotton, wool or silk, the presence of a proper amount of atmospheric moisture is essential for the best results. The amount which nature provides is very irregular and is seldom sufficient. Most progressive textile mills are equipped with a humidifying apparatus to insure a proper amount of moisture, and modern practice favors the use of automatic regulators for keeping the relative humidity constant, and avoiding fluctuations in humidity which otherwise prevent the best production.

Absolute humidity is the actual weight of water vapor present in the atmosphere, stated in grains per cubic foot of air. The higher the temperature the greater is the amount of moisture which the air contains at saturation.

Relative humidity is the ratio between the amount of water vapor which is actually present and that which the air would contain at the same temperature if actually saturated. The ratio is stated as a percentage. For instance, at 70° F. a cubic foot of air saturated with water vapor contains eight grains of moisture. When air at 70° F. is found to contain six grains of moisture the relative humidity is therefore said to be 75%.

For the satisfactory processing of cotton at ordinary temperature, the following is recommended:

| | Relative Humidity. |
|---|--------------------|
| Carding and Drawing | 45 to 50% |
| Combing | 60 " 70% |
| Roving and Fine Fly Frames | 50 " 60% |
| Spinning, Twisting, Spooling and Warping | 60 " 70% |
| Weaving | 65 " 80% |

Higher humidity than those suggested above may be found necessary for the spinning and weaving of special products.

WHITIN MACHINE WORKS

Established 1831

MANUFACTURERS OF THE FOLLOWING MACHINES

COTTON MACHINERY

| | |
|----------------------|------------------|
| Cleaning | Combing Machines |
| Opening | Drawing Frames |
| Conveying | Roving Frames |
| Distributing | Spinning Frames |
| Picking | Spoolers |
| Revolving Flat Cards | Twisters |
| Sliver Lap Machines | Reels |
| Ribbon Lap Machines | Quillers |

COTTON WASTE MACHINERY

Cotton and Woolen Systems

| | |
|-------------------------|----------------------|
| Openers | Revolving Flat Cards |
| Pickers | Derby Doublers |
| Willows | Roving Frames |
| Card Feeds | Spinning Frames |
| Full Roller Cards | Spoolers |
| Condensers | Twisters |
| Special Spinning Frames | |

SILK MACHINERY

Ring Twisters

WOOLEN MACHINERY

| | |
|-------------------|----------------------|
| Card Feeds | Condensers |
| Full Roller Cards | Wool Spinning Frames |

WORSTED MACHINERY

| | |
|--------------------|---------------|
| Cone Roving Frames | Ring Twisters |
|--------------------|---------------|

SUPPLIES

Rings, Spindles, Rolls, Flyers, Hank Clocks and Roll Spreaders

MEMORANDA

**Date Loaned**[illegible]

SPECIAL COLL TS 1583 .W58

Y22 1923

Illustrated and descriptive
catalogue of Whitin cotton

36

C.11



